eProjects WO#: 1313775
eProjects WO#: 1313772

I564 CEP113 and CEP10
DRIVEWAY AND PARKING IMPROVEMENTS

And

I564 CEP TANK FIRE SYSTEM RELOCATION

At the

NAVAL STATION NORFOLK

DESIGNED BY:

NAVFAC MID-ATLANTIC; PWD NORFOLK
FACILITIES ENGINEERING & ACQUISITION DIVISION
9742 MARYLAND AVENUE
NORFOLK, VIRGINIA 23511-3095

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Date: 07MAY15

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SECTION 01 11 00

SUMMARY OF WORK
08/11

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes demoltion of existing asphalt, curb and gutter, sidewalk, fencing and gates, lighting, monitoring wells, vegetation, hazardous material and other site features as indicated on drawings. New work to include providing driveway access to Buildings CEP-113 and CEP-10 with new fencing and gates and modifications to the fire suppression system. Other new work includes pavements, curb and gutter, lighting, striping and signage, pedestrian access, storm water management, landscaping, and incidental related work.

1.1.2 Location

The work shall be located at the Naval Station, Norfolk, Virginia, approximately as indicated. The exact location will be shown by the Contracting Officer.

1.2 PROJECT ENVIRONMENTAL GOALS

Contractor shall distribute copies of the Environmental Goals to each subcontractor and the Contracting Officer. The overall goal for design, construction, and operation is to produce a building that meets the functional program needs and incorporates the principles of sustainability. Specifically:

a. Preserve and restore the site ecosystem and biodiversity; avoid site degradation and erosion. Minimize offsite environmental impact.

b. Use the minimum amount of energy, water, and materials feasible to meet the design intent. Select energy and water efficient equipment and strategies.

c. Use environmentally preferable products and decrease toxicity level of materials used.

d. Use renewable energy and material resources.

e. Optimize operational performance (through commissioning efforts) in order to ensure energy efficient equipment operates as intended. Consider the durability, maintainability, and flexibility of building systems.

f. Manage construction site and storage of materials to ensure no negative impact on the indoor environmental quality of the building.

g. Reduce construction waste through reuse, recycling, and supplier take-back.

1.3 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract.

Before work is started, the Contractor shall arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.4 EXISTING WORK

In addition to "FAR 52.236-9, Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements":

a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better than that which existed before new work started.

1.5 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation by contacting the Contracting Officer 15 calendar days in advance. Scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground where existing underground utilities are discovered. Verify the elevations of existing piping, utilities,and any type of underground or encased obstruction not indicated to be specified or removed but indicated or discovered during scanning in locations to be traversed by piping, ducts, and other work to be conducted or installed.

1.5.1 Notification Prior to Excavation

Notify the Contracting Officer at least 15 days prior to starting excavation work. Contact Miss Utility 48 hours prior to excavating. Contractor is responsible for marking all utilities not marked by Miss Utility.

1.6 Navy and Marine Corps (NMCI) Coordination Requirements

1.6.1 NMCI Contractor Access

The NMCI Contractor must be allowed access to the facility towards the end of construction (finishes 90 percent complete, rough-in 100 percent complete, Inside Plant (ISP)/Outside Plant (OSP) infrastructure in place) to provide equipment in the telecommunications rooms and make final connections. Coordinate efforts with the NMCI contractor to facilitate joint use of building spaces during the final phases of construction. After the Contracting Officer has facilitated coordination meetings between the two contractors, the construction contractor must, within one week, incorporate the effort of additional contractor coordination into construction schedule to demonstrate plan for maintaining the contract duration.

1.7 SALVAGE MATERIAL AND EQUIPMENT

Items designated by the Contracting Officer to be salvaged shall remain the property of the Government.

The salvaged property shall be segregated, itemized, delivered, and off-loaded at the Government designated storage area located within Naval Station Norfolk.

Contractor shall maintain property control records for material or equipment designated as salvage. Contractor's system of property control may be used if approved by the Contracting Officer. Contractor shall be responsible for storage and protection of salvaged materials and equipment until disposition by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
11/11

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contact Personnel; G

Personnel List; G

Vehicle List; G

Statement of Acknowledgement Form SF 1413; G

1.2 SPECIAL SCHEDULING REQUIREMENTS

a. Have materials, equipment, and personnel required to perform the work at the site prior to the commencement of the work.

b. Building CEP-113, CEP-10, and adjacent tanks (CEP-1, 2, 3, 11) will remain in operation during the entire construction period. The Contractor must conduct his operations so as to cause the least possible interference with normal operations of the activity.

c. Permission to interrupt any Activity roads, railroads, and/or utility service must be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

d. The work under this contract requires special attention to the scheduling and conduct of the work in connection with existing operations. Identify on the construction schedule each factor which constitutes a potential interruption to operations.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. Ingress and egress of Contractor vehicles at the Activity is limited to Gate 5. To minimize traffic congestion, delivery of materials must be outside of peak traffic hours (6:30 to 8:00 a.m. and 3:30 to 5:00 p.m.) unless otherwise approved by the Contracting Officer. Wear hard hats in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Mark Contractor equipment for identification.

1.3.1.1 Subcontractors and Personnel Contacts

Provide a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.3.1.2 Identification Badges and Installation Access

Application for and use of badges will be as directed. Obtain access to the installation by participating in the Navy Commercial Access Control System (NCACS), or by obtaining passes each day from the Base Pass and Identification Office. Costs for obtaining passes through the NCACS are the responsibility of the Contractor. One-day passes, issued through the Base Pass and Identification Office, will be furnished without charge. Furnish a completed EMPLOYMENT ELIGIBILITY VERIFICATION (DHS FORM I-9) form for all personnel requesting badges. This form is available at http://www.uscis.gov/portal/site/uscis by searching or selecting Employment Verification (Form I-9) . Immediately report instances of lost or stolen badges to the Contracting Officer.

a. NCACS Program: NCACS is a voluntary program in which Contractor personnel who enroll, and are approved, are subsequently granted access to the installation for a period up to one year, or the length of the contract, whichever is less, and are not required to obtain a new pass from the Base Pass and Identification Office for each visit. The Government performs background screening and credentialing. Throughout the year the Contractor employee must continue to meet background screening standards. Periodic background screenings are conducted to verify continued NCACS participation and installation access privileges. Under the NCACS program, no commercial vehicle inspection is required, other than for Random Anti-Terrorism Measures (RAM) or in the case of an elevation of Force Protection Conditions (FPCON). Information on costs and requirements to participate and enroll in NCACS is available at http://www.rapidgate.com or by calling 1-877-727-4342. Contractors should be aware that the costs incurred to obtain NCACS credentials, or costs related to any means of access to a Navy Installation, are not reimbursable. Any time invested, or price(s) paid, for obtaining NCACS credentials will not be compensated in any way or approved as a direct cost of any contract with the Department of the Navy.

   Delivery companies submitting NCACS applications must only be granted access if the prime Contractor has included the company on a participant’s spreadsheet provided in advance to the Contracting Officer. This form must be provided by the Government upon request.

b. One-Day Passes: Participation in the NCACS is not mandatory, and if the Contractor chooses to not participate, the Contractor's personnel will have to obtain daily passes, be subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government will not be responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the NCACS.

1.3.1.3 Personnel Entry Approval

Failure to obtain entry approval will not affect the contract price or time of completion.

1.3.1.4 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installations under the cognizance of NAVFAC except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.3.2 Working Hours

Regular working hours must consist of an 8 1/2 hour period Monday through Friday, excluding Government holidays.

1.3.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in a manner approved by the Contracting Officer. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.3.4 Occupied and Existing Buildings

The Contractor shall be working around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

The existing buildings and their contents must be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

1.3.5 Utility Cutovers and Interruptions

a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in the paragraph "Work Outside Regular Hours."

b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.

c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, compressed air, and are considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours."

d. Operation of Station Utilities: The Contractor must not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor must notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.4 SECURITY REQUIREMENTS

1.4.1 Naval Base, Norfolk, VA

a. Contractor registration. Register with the Base Police Truck Investigation Team, located behind pass and ID Office (Bldg CD-9) on Hampton Boulevard, Naval Air Station, Norfolk, VA 23511-5000, telephone number (757) 322-2979.

b. Storage and office trailer registration. Register storage and office trailers to be used on base with the truck investigation team. Trailers must meet State law requirements and must be in good condition.

(1) Trailers must be lockable and must be locked when not in use.

(2) Trailers must have a sign in the lower left hand corner of left door of trailer with the following information: Company name, address, registration number of trailer or vehicle identification number, location on base, duration of contract or stay on base, contract number, local on-base phone number, off-base phone number of main office, and emergency recall person and phone number.

c. Equipment markings. Equipment owned or rented by the company must have the company name painted or stenciled on the equipment in a conspicuous location. Rented equipment is to be conspicuously marked with a tag showing who rented the equipment. Register the equipment with the truck investigation team.

d. Procedure information. For additional information regarding registration procedures, contact the Officer in Charge of Construction at (757) 445-1463 or Base Police at (757) 444-8856.

1.4.2 Passes

Submit request for personnel and vehicle passes together. Include the Certificate of Insurance for Contractor and SubContractor(s) and the Statement of Acknowledgement Form SF 1413 with the submittal. Passes will be normally issued within 21 days.

1.4.2.1 Control

Maintain strict accountability over passes. Immediately report to the source of issue, passes missing or lost and the circumstances. If the Contractor has another active contract or one commencing imediately, employees' names may be transferred from one contract to the other. Final payment will not be effected until employees are transferred to another contract or the records are cleared. Furnish a signed letter, countersigned by the source of the issue, stating that passes have been turned in.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 20 00.00 20

PRICE AND PAYMENT PROCEDURES
11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP-1110-1-8	(2009) Construction Equipment Ownership and Operating Expense Schedule

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Schedule of Prices; G

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

Within 15 calendar days of notice of award, prepare and deliver to the Contracting Officer a Schedule of Prices (construction contract) as directed by the Contracting Officer. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices. Costs shall be summarized and totals provided for each construction category.

1.3.2 Schedule Instructions

Payments will not be made until the Schedule of Prices has been submitted to and accepted by the Contracting Officer. Identify the cost for site work, and include incidental work to the 5 ft line. Identify costs for the building(s), and include work out to the 5 ft line. Work out to the 5 ft line shall include construction encompassed within a theoretical line 5 ft from the face of exterior walls and shall include attendant construction, such as pad mounted HVAC cooling equipment, cooling towers, and transformers placed beyond the 5 ft line.

1.4 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause "DFARS 252.236-7000, Modification Proposals-Price Breakdown," and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, equipment use rates shall be based upon the applicable provisions of the EP-1110-1-8.

1.5 CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT

1.5.1 Content of Invoice

Requests for payment will be processed in accordance with the Contract Clause FAR 52.232-27, Prompt Payment Construction Contracts and FAR 52.232-5, Payments Under Fixed-Price Construction Contracts. The requests for payment shall include the documents listed below.

a. The Contractor's invoice, on NAVFAC Form 7300/30 furnished by the Government, showing in summary form, the basis for arriving at the amount of the invoice. Form 7300/30 shall include certification by Quality Control (QC) Manager as required by the contract.

b. The Estimate for Voucher/ Contract Performance Statement on NAVFAC Form 7300/31 furnished by the Government, showing in detail: the estimated cost, percentage of completion, and value of completed performance. Use NAVFAC LANT Form 4-330/110 (New 7/84) on NAVFAC MIDLANT contracts when a Monthly Estimate for Voucher is required.

c. Updated Project Schedule and reports required by the contract.

d. Contractor Safety Self Evaluation Checklist.

e. Other supporting documents as requested.

f. Updated copy of submittal register.

g. Invoices not completed in accordance with contract requirements will be returned to the Contractor for correction of the deficiencies.

h. Contractor's Monthly Estimate for Voucher (NAVFAC LANT Form 4-330/110 (New 7/84)) with Subcontractor and supplier payment certification.

i. Affidavit to accompany invoice (NAVFAC LANT NORVA Form 4-4235/4 (Rev.5/81)).

j. Materials on Site.

1.5.2 Submission of Invoices

If NFAS Clause 5252.232-9301 is included in the contract, the documents listed in paragraph "CONTENT OF INVOICE" shall be provided in their entirety as attachments in Wide Area Work Flow (WAWF) for each invoice submitted. The maximum size of each WAWF attachment is two megabytes, but there are no limits on the number of attachments. If a document cannot be attached in WAWF due to system or size restriction it shall be provided as instructed by the Contracting Officer.

Monthly invoices and supporting forms for work performed through the anniversary award date of the contract shall be submitted to the Contracting Officer within 5 calendar days of the date of invoice. For example, contract award date is the 7th of the month, the date of each monthly invoice shall be the 7th and the invoice shall be submitted by the 12th of the month.1.5.3 Final Invoice

a. A final invoice shall be accompanied by the certification required by DFARS 252.247.7023 TRANSPORTATION OF SUPPLIES BY SEA, and the

Contractor's Final Release. If the Contractor is incorporated, the Final Release shall contain the corporate seal. An officer of the corporation shall sign and the corporate secretary shall certify the Final Release.

b. For final invoices being submitted via WAWF, the original Contractor's Final Release Form and required certification of Transportation of Supplies by Sea must be provided directly to the respective Contracting Officer prior to submission of the final invoice. Once receipt of the original Final Release Form and required certification of Transportation of Supplies by Sea has been confirmed by the Contracting Officer, the Contractor shall then submit final invoice and attach a copy of the Final Release Form and required certification of Transportation of Supplies by Sea in WAWF.

c. Final invoices not accompanied by the Contractor's Final Release and required certification of Transportation of Supplies by Sea will be considered incomplete and will be returned to the Contractor.

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of itemized requests by the Contractor which comply with the requirements of this section, and will be subject to reduction for overpayments or increase for underpayments made on previous payments to the Contractor.

1.6.1 Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this contract will, at the discretion of the Contracting Officer, be subject to reductions and/or suspensions permitted under the FAR and agency regulations including the following in accordance with "FAR 32.503-6:

a. Reasonable deductions due to defects in material or workmanship;

b. Claims which the Government may have against the Contractor under or in connection with this contract;

c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor; and

d. Failure to provide up to date record drawings not current as stated in Contract Clause "FAC 5252.236-9310, Record Drawings."

1.6.2 Payment for Onsite and Offsite Materials

Progress payments may be made to the contractor for materials delivered on the site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.

b. Materials delivered on the site but not installed, including completed preparatory work, and off-site materials to be considered for progress payment shall be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment consideration include, but are not limited to,

structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings,precast/prestressed concrete products, plastic lumber (e.g., fender piles/curbs), and high-voltage electrical cable. Materials not acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.

c. Materials to be considered for progress payment prior to installation shall be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Schedule of Prices requirement of this contract. Requests for progress payment consideration for such items shall be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 have been met.

d. Materials are adequately insured and protected from theft and exposure.

e. Provide a written consent from the surety company with each payment request for offsite materials.

f. Materials to be considered for progress payments prior to installation shall be stored either in Hawaii, Guam, Puerto Rico, or the Continental United States. Other locations are subject to written approval by the Contracting Officer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS
11/11

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View location map; G

Progress and completion pictures; G

1.2 VIEW LOCATION MAP

Submit to the Contracting Officer, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

1.3 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Provide monthly, and within one month of the completion of work,digital photographs, 1600x1200x24 bit true color inJPEG file format showing the sequence and progress of work. Take a minimum of 5 digital photographs each week throughout the entire project from a minimum of ten views from points located by the Contracting Officer. Submit a view location sketch indicating points of view. Submit with the monthly invoice two sets of digital photographs each set on a separate CD-R, cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Photographs for each month shall be in a separate monthly directory and each file shall be named to indicate its location on the view location sketch. The view location sketch shall also be provided on the CD as digital file. All file names shall include a date designator. Cross reference submittals in the appropriate daily report. Photographs shall be provided for unrestricted use by the Government.

1.4 MINIMUM INSURANCE REQUIREMENTS

Procure and maintain during the entire period of performance under this contract the following minimum insurance coverage:

a. Comprehensive general liability: $500,000 per occurrence

b. Automobile liability: $200,000 per person, $500,000 per occurrence for bodily injury, $20,000 per occurrence for property damage

c. Workmen's compensation as required by Federal and State workers' compensation and occupational disease laws.

d. Employer's liability coverage of $100,000, except in States where

workers compensation may not be written by private carriers,

e. Others as required by State.

1.5 SUPERVISION

Have at least one qualified supervisor capable of reading, writing, and conversing fluently in the English language on the job site during working hours. In addition, if a Quality Control (QC) representative is required on the contract, then that individual shall also have fluent English communication skills.

1.6 PRECONSTRUCTION CONFERENCE

After award of the contract but prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule of prices or earned value report, shop drawings, and other submittals, scheduling programming, prosecution of the work, and clear expectations of the "Interim DD Form 1354" Submittal. Major subcontractors who will engage in the work shall also attend.

1.7 PARTNERING

To most effectively accomplish this contract, the Government requires the formation of a cohesive partnership within the Project Team whose members are from the Government, the Contractor and their Subcontractors. Key personnel from the Supported Command, the End User (who will occupy the facility), NAVFAC (Echelon III and IV), the Navy Region/Installation, the Contractor and Subcontractors, and the Designer of Record will be invited to participate in the Partnering process. The Partnership will draw on the strength of each organization in an effort to achieve a project that is without any safety mishaps, conforms to the Contract, and stays within budget and on schedule.

The Contracting Officer will provide Information on the Partnering Process and a list of key and optional personnel who should attend the Partnering meeting.

1.7.1 Informal Partnering

The Contracting Officer will organize the Partnering Sessions with key personnel of the project team, including Contractor personnel and Government personnel.

The Initial Partnering session should be a part of the Pre-Construction Meeting. Partnering sessions will be held at a location agreed to by the Contracting Officer and the Contractor (typically a conference room provided by the PWD FEAD/ROICC office or the Contractor).

The Initial Informal Partnering Session will be conducted and facilitated using electronic media (a video and accompanying forms) provided by the Contracting Officer.

The Partners will determine the frequency of the follow-on sessions.

1.8 AVAILABILITY OF CADD DRAWING FILES

After award and upon request, the electronic "Computer-Aided Drafting and Design (CADD)" drawing files will only be made available to the Contractor for use in preparation of construction data related to the referenced contract subject to the following terms and conditions. Request specific drawing numbers of files required; the entire set of drawing files will not be provided.

Data contained on these electronic files shall not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor shall make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor shall, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CADD drawing files are not construction documents. Differences may exist between the CADD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CADD files, nor does it make representation to the compatibility of these files with the Contractors hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished CADD files, the signed and sealed construction documents shall govern. The Contractor is responsible for determining if any conflict exists. Use of these CADD files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project.

If the Contractor uses, duplicates and/or modifies these electronic CADD files for use in producing construction drawings and data related to this contract, all previous indicia of ownership (seals, logos, signatures, initials and dates) shall be removed.

1.9 ELECTRONIC MAIL (E-MAIL) ADDRESS

The Contractor shall establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, the Contractor shall provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use email to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc. Multiple email address will not allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to this email address.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 32 16.00 20

CONSTRUCTION PROGRESS DOCUMENTATION
11/09

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction schedule; G

1.2 ACCEPTANCE

Prior to the start of work, prepare and submit to the Contracting Officer for acceptance a construction schedule in the form of a Bar Chart in accordance with the terms in Contract Clause "FAR 52.236-15, Schedules for Construction Contracts," except as modified in this contract. Acceptance of an error free Baseline Schedule and updates is a condition precedent to processing the Contractor's pay request.

1.3 SCHEDULE FORMAT

1.3.1 Bar Chart Schedule

The Bar Chart shall show submittals, government review periods, material/equipment delivery, utility outages, on-site construction, inspection, testing, and closeout activities. The Bar Chart shall be time scaled and generated using an electronic spreadsheet program.

1.4 UPDATED SCHEDULES

Update the Construction schedule at monthly intervals or when the schedule has been revised. The updated schedule shall be kept current, reflecting actual activity progress and plan for completing the remaining work. Submit copies of purchase orders and confirmation of delivery dates as directed.

1.5 3-WEEK LOOK AHEAD SCHEDULE

The Contractor shall prepare and issue a 3-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Construction Schedule. The work plans shall be keyed to activity numbers when a NAS is required and updated each week to show the planned work for the current and following two-week period. Additionally, include upcoming outages, closures, preparatory meetings, and initial meetings. Identify critical path activities on the Three-Week Look Ahead Schedule. The detail work plans are to be bar chart type schedules, maintained separately from the Construction Schedule on an electronic spreadsheet program and printed on 8 ½ by 11 sheets as directed by the Contracting Officer. Activities shall not exceed 5 working days in duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work. Three hard copies and one electronic file of the 3-Week Look Ahead Schedule

shall be delivered to the Contracting Officer no later than 8 a.m. each Monday and reviewed during the weekly CQC Coordination Meeting.

1.6 CORRESPONDENCE AND TEST REPORTS:

All correspondence (e.g., letters, Requests for Information (RFIs), e-mails, meeting minute items, Production and QC Daily Reports, material delivery tickets, photographs, etc.) shall reference Schedule activities that are being addressed. All test reports (e.g., concrete, soil compaction, weld, pressure, etc.) shall reference schedule activities that are being addressed.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES
05/11

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to or commencing work on site.

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction progress schedule

Network Analysis Schedule (NAS)

Submittal register

Schedule of prices

Health and safety plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts,

instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS)concerning impedances, hazards and safety precautions.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

Interim "DD Form 1354" with cost breakout for all assets 30 days prior to facility turnover.

1.1.2 Approving Authority

Office or designated person authorized to approve submittal.

1.1.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor QC approval. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register; G

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.4 FORWARDING SUBMITTALS REQUIRING GOVERNMENT APPROVAL

1.4.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the Public Works Department Norfolk, Facilities Engineering and Acquisition Division, Building E-26, 1721 Piersy Street, Norfolk, Virginia, 23511 Architect-Engineer: submittals required in the technical sections of this specification, including shop drawings, product data and samples. One copy of the transmittal form for all submittals

shall be forwarded to the Resident Officer in Charge of Construction.

The Architect-Engineer for this project will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

1.5 PREPARATION

1.5.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels to office of approving authority. Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled, "Identifying Submittals," of this section. Process transmittal forms to record actions regarding samples.

1.5.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction contract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.5.3 Format for SD-02 Shop Drawings

Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled, "Identifying Submittals," of this section.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than 3 inches on the right hand side of each sheet for the Government disposition stamp.

Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Include the nameplate data, size and capacity on drawings. Also include applicable federal, military, industry and technical society publication references.

1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.

Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of SD-07 Certificates.

Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, submit as specified for SD-07 Certificates.

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition

of construction effort.

Submit manufacturer's instructions prior to installation.

1.5.5 Format of SD-04 Samples

Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at time of use.

Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.

When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.5.6 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.5.7 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

1.5.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

1.6 QUANTITY OF SUBMITTALS

1.6.1 Number of Copies of SD-02 Shop Drawings

Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer. Electronic PDF samples will also be accepted.

1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

1.6.3 Number of Samples SD-04 Samples

a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

1.6.4 Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop drawings.

1.6.5 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

1.6.6 Number of Copies of SD-10 Operation and Maintenance Data

Submit Five copies of O&M Data to the Contracting Officer for review and approval.

1.6.7 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit two sets of administrative submittals.

1.7 VARIATIONS

Variations from contract requirements require both Designer of Record (DOR) and Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

1.7.1 Considering Variations

Discussion with Contracting Officer prior to submission, after consulting with the DOR, will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

1.7.2 Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government, including the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.7.3 Warranting That Variations Are Compatible

When delivering a variation for approval, Contractor, including its Designer(s) of Record, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.7.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.8 SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the Government.

1.8.1 Use of Submittal Register

Submit submittal register. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.8.2 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor with each submittal throughout contract.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.8.3 Approving Authority Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (l) List date of submittal receipt.

Column (m) through (p) List Date related to review actions.

Column (q) List date returned to Contractor.

1.8.4 Action Codes

Entries for columns (j) and (o), are to be used are as follows (others may be prescribed by Transmittal Form):

1.8.5 Copies Delivered to the Government

Deliver one copy of submittal register updated by Contractor to Government with each invoice request.

1.9 SCHEDULING

Partial submittals and non-collated copies will be promptly rejected by the Government. All submittal requirements must be present with each initial submission.

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

e. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals for Contracting Officer approval. Period of review for submittals with Contracting Officer approval begins when Government receives submittal from QC organization.

f. For submittals requiring review by fire protection engineer, allow review period, beginning when Government receives submittal from QC organization, of 30 working days for return of submittal to the Contractor.

g. Period of review for each resubmittal is the same as for initial submittal.

1.9.1 Reviewing, Certifying, Approving Authority

The QC organization is responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC Manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates Contracting Officer is approving authority for that submittal item.

1.9.2 Constraints

Conform to provisions of this section, unless explicitly stated otherwise for submittals listed or specified in this contract.

Submit complete submittals for each definable feature of work.

1.9.3 QC Organization Responsibilities

a. Note date on which submittal was received from Contractor on each submittal.

b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.

c. Review submittals for conformance with project design concepts and compliance with contract documents.

d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

(1) When QC Manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Approved/Accepted Submittals," of the section."

(2) When Contracting Officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

e. Ensure that material is clearly legible.

f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is Contracting Officer, QC organization will certify submittals forwarded to Contracting Officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is

submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC Manager _____, Date _____"
(Signature)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Approved by QC Manager _____, Date _____"
(Signature)

g. Sign certifying statement or approval statement. The QC organization member designated in the approved QC plan is the person signing certifying statements. The use of original ink for signatures is required. Stamped signatures are not acceptable.

h. Update submittal register database as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by Contracting Officer.

i. Retain a copy of approved submittals at project site, including Contractor's copy of approved samples.

1.10 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received from QC Manager.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph entitled, "Review Notations," of this section and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date approved submittals. One copy of the approved submittal will be retained by the Contracting Officer and 5 copies of the submittal will be returned to the Contractor.

1.10.1 Review Notations

Contracting Officer review will be completed within 15 calendar days after date of submission. Submittals will be returned to the Contractor with the

following notations:

a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" "or approved except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

1.11 DISAPPROVED OR REJECTED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.12 APPROVED/ACCEPTED SUBMITTALS

The Contracting Officer's approval or acceptance of submittals is not to be construed as a complete check, and indicates only that

Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.13 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract

requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

I564 CEP113 AND CEP10 DRIVEWAY AND PARKING IMPROVEMENTS

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 14 00	SD-01 Preconstruction Submittals															
			List of Contact Personnel	1.3.1.1	G													
			Personnel List		G													
			Vehicle List		G													
			Statement of Acknowledgement		G													
			Form SF 1413															
		01 20 00.00 20	SD-01 Preconstruction Submittals															
			Schedule of Prices	1.3	G													
		01 30 00	SD-01 Preconstruction Submittals															
			View location map	1.2	G													
			Progress and completion pictures	1.3	G													
		01 32 16.00 20	SD-01 Preconstruction Submittals															
			Construction schedule	1.2	G													
		01 33 00	SD-01 Preconstruction Submittals															
			Submittal Register	1.8	G													
		01 35 26	SD-01 Preconstruction Submittals															
			Accident Prevention Plan (APP)	1.7	G													
			Activity Hazard Analysis (AHA)	1.8	G													
			Crane Critical Lift Plan	1.7.1	G													
			Crane Operators	1.6.1.3	G	A												
			SD-06 Test Reports															
			Notifications and Reports	1.12														
			Accident Reports	1.12.2	G													
			Crane Reports	1.12.3														
			SD-07 Certificates															
			Confined Space Entry Permit	1.9														

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		01 35 26	Hot work permit	1.9														
			License Certificates	1.14														
			Contractor Safety Self-Evaluation	1.4	G	A												
			Checklist															
			Certificate of Compliance	1.12.4														
		01 45 00.10 20	SD-01 Preconstruction Submittals															
			QC Plan	1.6	G													
		01 50 00	SD-01 Preconstruction Submittals															
			Construction site plan	1.4	G													
			Traffic control plan	3.3.1	G													
			SD-06 Test Reports															
			Backflow Preventer Tests	2.2.5	G													
			SD-07 Certificates															
			Backflow Tester	1.5.1	G													
			Backflow Preventers	1.5														
		01 57 19.00 20	SD-01 Preconstruction Submittals															
			Preconstruction Survey	1.5.1	G													
			Solid Waste Management Plan	3.4	G													
			and Permit															
			Regulatory Notifications	1.5.2	G													
			Environmental Management Plan	3.1	G													
			Storm Water Pollution Prevention	3.2.2.1	G													
			Plan															

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		01 57 19.00 20	Storm Water Notice of Intent (for	3.2.2.1	G													
			NPDES coverage under the															
			general permit for construction															
			activities)															
			Dirt and Dust Control Plan	3.14.1														
			Contractor Hazardous Material	3.6	G													
			Inventory Log															
			SD-06 Test Reports															
			Laboratory Analysis	3.13.2.2														
			Erosion and Sediment Control	3.2.2														
			Inspection Reports															
			Storm Water Inspection Reports	3.2.2														
			for General Permit															
			Contractor 40 CFR employee	1.5.5														
			training records															
			Solid Waste Management Report	3.4.1	G													
			SD-11 Closeout Submittals															
			Storm Water Pollution Prevention	3.2.2.2	G													
			Plan compliance notebook															
			Waste Determination	3.5														
			Documentation															
			Disposal Documentation for	3.6.1														
			Hazardous and Regulated Waste															
			Contractor 40 CFR Employee	1.5.5														
			Training Records															
			Solid Waste Management Permit	3.4														

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		01 57 19.00 20	Solid Waste Management Report	3.4.1														
			Contractor Hazardous Material	3.6	G													
			Inventory Log															
			Hazardous Waste/Debris	3.13.2														
			Management															
			Regulatory Notifications	1.5.2														
		01 74 19	SD-01 Preconstruction Submittals															
			Waste Management Plan	1.6	G													
			SD-11 Closeout Submittals															
			Records	1.7														
		01 78 00	SD-03 Product Data															
			Warranty Management Plan	1.4.1														
			Final Cleaning	1.6														
			Instructions	1.4.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	1.5														
			Manuals															
			SD-11 Closeout Submittals															
			As-Built Drawings	1.3.1														
			Interim Form DD1354	1.7	G													
			Checklist for Form DD1354	1.7	G													
		02 84 16	SD-07 Certificates															
			Qualifications of CIH	1.8.1	G													
			Training Certification	1.8.1	G													

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		02 84 16	PCB and Lamp Removal Work Plan	1.8.2	G													
			PCB and Lamp Disposal Plan	1.8.3	G													
			SD-11 Closeout Submittals															
			Transporter certification	3.5.2	G													
			Certification of Decontamination	3.2.4														
			Certificate of Disposal and/or recycling	3.5.2.1														
		07 84 00	SD-02 Shop Drawings															
			Firestopping Materials	2.1	G													
			SD-06 Test Reports															
			Inspection	3.3	G													
			SD-07 Certificates															
			Inspector Qualifications	1.4.2														
			Firestopping Materials	2.1														
			Installer Qualifications	1.4.1	G													
		12 93 00	SD-02 Shop Drawings															
			Shelters	2.1														
			Assembly Instruction Drawings	1.3.2														
			SD-03 Product Data															
			Shelters	2.1														
			SD-06 Test Reports															
			Testing	3.2														
		21 13 21.00 20	SD-02 Shop Drawings															
			Fire extinguishing system	1.2.1.1	G													
			SD-03 Product Data															

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		21 13 21.00 20	Pipe, fittings, and mechanical couplings	2.2.1	G													
			Valves	2.2.4	G													
			Pipe hangers and supports	2.2.3	G													
			Fire department inlet connections	2.2.8	G													
			SD-05 Design Data															
			Hydraulic calculations	1.2.1.2	G													
			Pressure discharge graphs or tables	1.2.1.2	G													
			SD-06 Test Reports															
			Preliminary tests	3.5.1	G													
			Acceptance tests	3.5.2	G													
			SD-07 Certificates															
			Qualifications of installer	1.4.1	G													
			SD-10 Operation and Maintenance Data															
			fire extinguishing system	1.2.1.1	G													
			SD-11 Closeout Submittals															
			As-built drawings for the fire extinguishing system	1.2.1.3	G													
		26 08 00	SD-06 Test Reports															
			Acceptance tests and inspections	3.1	G													
			SD-07 Certificates															
			Qualifications	1.4.1	G													
			Acceptance test and inspections procedure	1.4.3	G													

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		26 20 00	SD-02 Shop Drawings															
			Marking strips	3.1.5.1	G													
			SD-03 Product Data															
			Receptacles	2.8	G													
			Circuit breakers	2.9.1	G													
			Motor controllers	2.11	G													
			SD-06 Test Reports															
			600-volt wiring test	3.4.2	G													
			Grounding system test	3.4.3	G													
		26 56 00	SD-01 Preconstruction Submittals															
			Photometric Plan	1.5.2	G													
			LED Luminaire Warranty	1.7.1	G													
			SD-02 Shop Drawings															
			Luminaire drawings	1.5.1.1	G													
			Poles	1.5.1.2	G													
			SD-03 Product Data															
			LED Luminaires	2.2	G													
			Luminaire Light Sources	2.2.2	G													
			Luminaire Power Supply Units	2.2.3	G													
			(Drivers)															
			Photocell	2.3.1	G													
			Aluminum poles	2.4.1	G													
			Brackets	2.5														
			SD-05 Design Data															
			Design Data for luminaires	1.5.3	G													
			SD-06 Test Reports															

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		26 56 00	LED Luminaire - IES LM-79 Test	1.5.4	G													
			Report															
			LED Light Source - IES LM-80	1.5.5	G													
			Test Report															
			Operating test	3.2														
			SD-07 Certificates															
			Luminaire Useful Life Certificate	1.7.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Operational Service	1.8														
		28 20 00.00 20	SD-02 Shop Drawings															
			ESS components	1.6.1.1	G													
			Overall system schematic	1.6.1.2	G													
			SD-03 Product Data															
			Card reader	2.4.13.4	G													
			cable	2.4.14.2	G													
			Communications interface	2.4.14	G													
			devices															
			CCTV camera	2.4.15.1	G													
			CCTV lenses	2.4.15.1	G													
			Auxiliary CCTV camera	2.4.15.1	G													
			equipment															
			Video, Digital Video Recorder	2.4.15.6	G													
			(DVR)															
			Printer	2.4.16.3	G													
			Four quadrant multiplexer	2.4.15.6	G													

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		28 20 00.00 20	SD-06 Test Reports															
			ESS operational test plan	1.6.4	G													
			SD-07 Certificates															
			ESS operational test plan	1.6.4	G													
			Installer's qualifications	1.6.2.1	G													
			Instructor's qualifications	1.6.2.2	G													
			SD-10 Operation and Maintenance															
			Data															
			ESS components	1.6.1.1	G													
			ESS software	1.6.5	G													
			SD-11 Closeout Submittals															
			As-Built drawings	3.3.1	G													
		31 23 00.00 20	SD-01 Preconstruction Submittals															
			Shoring and Sheeting Plan	1.6.1														
			Dewatering work plan	1.6.2														
			SD-06 Test Reports															
			Borrow Site Testing	1.5	G													
			Fill and backfill	3.14.2.1	G													
			Select material	3.14.2.2	G													
			Density tests	3.14.2.3	G													
		32 11 23	SD-07 Certificates															
			Aggregate Material Certification	2.1.1	G													
			SD-06 Test Reports															
			Field Density Tests	1.5.1.2	G													
		32 12 17	SD-05 Design Data															
			MIX DESIGN	1.3.2	G													

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		32 12 17	MIX DESIGN	2.1	G													
		32 16 13	SD-03 Product Data															
			Concrete	2.1	G													
			SD-05 Design Data															
			Concrete Design Mix	2.1	G													
			SD-06 Test Reports															
			Field Quality Control	3.8														
		32 17 23.00 20	SD-03 Product Data															
			Paints for roads and streets	2.1.1	G													
			Thermoplastic compound	2.1.2	G													
			Thermoplastic compound	3.2.2.2	G													
			Equipment	1.5	G													
			Qualifications	1.7	G													
			SD-07 Certificates															
			Paints for roads and streets	2.1.1	G													
			Thermoplastic compound	2.1.2	G													
			Thermoplastic compound	3.2.2.2	G													
			SD-08 Manufacturer's Instructions															
			Paints for roads and streets	2.1.1														
			Thermoplastic compound	2.1.2														
			Thermoplastic compound	3.2.2.2														
		32 31 13.53	SD-02 Shop Drawings															
			Fence Installation	1.3.2	G													
			Fence Installation	3.1	G													
			Installation Drawings	1.3.2	G													

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		32 31 13.53	Location of gate, corner, end, and	1.3.2	G													
			pull posts															
			Gate Assembly	1.3.2	G													
			Gate Assembly	2.6.1	G													
			Gate Assembly	2.6.1	G													
			Gate Hardware and Accessories	1.3.2	G													
			Gate Hardware and Accessories	2.6.3	G													
			SD-03 Product Data															
			Fence Installation	1.3.2	G													
			Fence Installation	3.1	G													
			Gate Assembly	1.3.2	G													
			Gate Assembly	2.6.1	G													
			Gate Assembly	2.6.1	G													
			Gate Hardware and Accessories	1.3.2	G													
			Gate Hardware and Accessories	2.6.3	G													
			SD-07 Certificates															
			Chain Link Fence	2.2.1	G													
			reports	1.3.1														
			reports	1.3.1														
			Zinc Coating	1.3.1	G													
			Fabric	2.1.1	G													
			Barbed Wire	2.4.2	G													
			Stretcher Bars	2.1.1	G													
			Gate Hardware and Accessories	1.3.2	G													
			Gate Hardware and Accessories	2.6.3	G													
			Concrete	2.5	G													

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		32 31 13.53	GATE OPERATOR	2.7														
			SD-08 Manufacturer's Instructions															
			Fence Installation	1.3.2	G													
			Fence Installation	3.1	G													
			Gate Assembly	1.3.2	G													
			Gate Assembly	2.6.1	G													
			Gate Assembly	2.6.1	G													
			Hardware Assembly	3.6	G													
			Accessories	1.3.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Electro-Mechanical Locks	2.8														
			Gate Operator	2.7														
			operating and maintenance	3.6														
			instructions															
		33 11 00	SD-03 Product Data															
			Piping Materials	2.1.1	G													
			Water distribution main	2.1	G													
			Hydrants	2.1.2.2	G													
			Indicator posts	2.1.2.3	G													
			Valve boxes	2.1.2.4	G													
			SD-07 Certificates															
			Water distribution main	2.1	G													
			Water service line	2.2														
			Lining	2.1.1.1	G													
			hydrants	2.1.2.2	G													

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		33 11 00	SD-08 Manufacturer's Instructions															
			Delivery, storage, and handling	1.3	G													
			Installation	3.1.1	G													
		33 30 00	SD-02 Shop Drawings															
			Precast concrete manhole	2.3.1														
			Metal items	2.3.3														
			Frames, covers, and gratings	2.3.3.1														
			SD-03 Product Data															
			Pipeline materials	2.1														
		33 40 00	SD-03 Product Data															
			Placing Pipe	3.3														
			Pipe for Culverts and Storm	2.1														
			Drains															
			Frame and Cover for Gratings	2.3.5														
			SD-07 Certificates															
			Determination of Density	3.6.4														
		33 71 01	SD-03 Product Data															
			Insulators	2.3	G													
			Cutouts	2.10	G													
			Surge arresters	2.9	G													
			Guy strand	2.5														
			Anchors	2.7														
			SD-06 Test Reports															
			Field Quality Control	3.4	G													
			Ground resistance test reports	1.5.3	G													
		33 71 02	SD-02 Shop Drawings															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

I564 CEP113 AND CEP10 DRIVEWAY AND PARKING IMPROVEMENTS

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		33 71 02	Precast underground structures	1.4.1	G													
			SD-03 Product Data															
			Medium voltage cable	2.5	G													
			Medium voltage cable joints	2.7	G													
			Medium voltage cable	2.6	G													
			terminations															
			Precast concrete structures	2.12.2.1	G													
			Sealing Material	2.12.2.4														
			Pulling-In Irons	3.4.3														
			Manhole frames and covers	2.12.3	G													
			Handhole frames and covers	2.12.4	G													
			Composite/fiberglass handholes	2.12.6	G													
			Cable supports	2.13	G													
			SD-06 Test Reports															
			Medium voltage cable	2.15.2	G													
			qualification and production tests															
			Field Acceptance Checks and	3.17.1	G													
			Tests															
			Arc-proofing test	2.15.1	G													
			Cable Installation Plan and	3.3	G													
			Procedure															
			SD-07 Certificates															
			Cable splicer/terminator	1.4.2	G													
			Cable Installer Qualifications	1.4.3	G													

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
02/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.32	(2012) Fall Protection
ASSE/SAFE A10.34	(2001; R 2012) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.22	(2010) Articulating Boom Cranes
ASME B30.3	(2012) Tower Cranes
ASME B30.5	(2011) Mobile and Locomotive Cranes
ASME B30.8	(2010) Floating Cranes and Floating Derricks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2013) Standard for Portable Fire Extinguishers
NFPA 241	(2013) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 51B	(2014) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2014) National Electrical Code
NFPA 70E	(2012; Errata 2012) Standard for Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety

and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.1400	Cranes & Derricks in Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.500	Fall Protection
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

NAVFAC P-307	(2009; Change 1 Mar 2011; Change 2 Aug 2011)Management of Weight Handling Equipment

1.2 DEFINITIONS

a. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.

b. High Visibility Accident. Any mishap which may generate publicity or high visibility.

c. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

d. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

e. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

(1) Death, regardless of the time between the injury and death, or the length of the illness;

(2) Days away from work (any time lost after day of injury/illness onset);

(3) Restricted work;

(4) Transfer to another job;

(5) Medical treatment beyond first aid;

(6) Loss of consciousness; or

(7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

f. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

g. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the eight elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; or collision, including unplanned contact between the load, crane, or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.) Any mishap meeting the criteria described above shall be documented in both the Contractor Significant Incident Report (CSIR) and using the NAVFAC prescribed Navy Crane Center (NCC) form submitted within five days both as provided by the Contracting Officer. Comply with additional requirements and procedures for accidents in accordance with NAVFAC P-307, Section 12.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Government acceptance, as defined in EM-385-1-1, is required for submittals with a "G,A" designation.

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Activity Hazard Analysis (AHA); G

Crane Critical Lift Plan; G

Proof of qualification for Crane Operators; G, A

SD-06 Test Reports

Notifications and Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph, "Notifications and Reports."

Accident Reports; G

Crane Reports

SD-07 Certificates

Confined Space Entry Permit

Hot work permit

License Certificates

Contractor Safety Self-Evaluation Checklist; G, A

Certificate of Compliance (Crane)

Submit one copy of each permit/certificate attached to each Daily Production Report.

1.4 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. Complete the checklist monthly and submit with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90 may result in retention of up to 10 percent of the voucher. Additionally, provide a Monthly Exposure Report and attach to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the voucher. The Contracting Officer will submit a copy of the Contractor Safety Self-Evaluation and Monthly Exposure Report to the local safety and occupational health office.

1.5 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations . Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.6.1 Personnel Qualifications

1.6.1.1 Site Safety and Health Officer (SSHO)

The SSHO must meet the requirements of EM 385-1-1 section 1 and ensure that

the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one (1) person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Designated Representative/alternate shall be at the work site at all times to implement and administer the Contractor's safety program and government-accepted Accident Prevention Plan. The SSHO's training, experience, and qualifications shall be as required by EM 385-1-1 paragraph 01.A.17, entitled SITE SAFETY AND HEALTH OFFICER (SSHO), and all associated sub-paragraphs.

A Competent Person shall be provided for all of the hazards identified in the Contractor's Safety and Health Program in accordance with the accepted Accident Prevention Plan, and shall be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Provide the credentials of the Competent Persons(s) to the the Contracting Officer for acceptance in consultation with the Safety Office.

1.6.1.1.1 Contractor Quality Control (QC) Person:

The Contractor Quality Control Person can be the SSHO on this project.

1.6.1.2 Competent Person for Confined Space Entry

Provide a "Competent Person" to supervise the entry into each confined space. That individual must meet the requirements and definition of Competent Person as contained in EM 385-1-1.

1.6.1.3 Crane Operators

Meet the crane operators requirements in USACE EM 385-1-1, Section 16 and Appendix I. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacitates of 50,000 pounds or greater, designate crane operators as qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Provide proof of current qualification. In addition, the Contractor shall comply with Contractor Operated Crane Requirements included in the latest revision of document NAVFAC P-307 Section 1.7.2 "Contractor Operated Cranes," and Appendix P, Figure P-1 and with 29 CFR 1926, Subpart CC.

1.6.2 Personnel Duties

1.6.2.1 Site Safety and Health Officer (SSHO)

The SSHO shall:

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily quality control report.

b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.

c. Maintain applicable safety reference material on the job site.

d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

e. Implement and enforce accepted APPS and AHAs.

f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

h. Maintain a list of hazardous chemicals on site and their material safety data sheets.

Failure to perform the above duties will result in dismissal of the superintendent, QC Manager, and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.6.3 Meetings

1.6.3.1 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.6.3.2 Safety Meetings

Conduct and document meetings as required by EM 385-1-1. Attach minutes showing contract title, signatures of attendees and a list of topics discussed to the Contractors' daily production report.

1.7 ACCIDENT PREVENTION PLAN (APP)

Use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan". Specific requirements for some of the APP elements are described below. The APP shall be job-specific and address any unusual or

unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer, the Contractor Quality control Manager, and any designated CSP or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34,) and the environment.

Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site. Continuously review and ammend the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.

1.7.1 EM 385-1-1 Contents

In addition to the requirements outlined in Appendix A of USACE EM 385-1-1, the following is required:

a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. Specify the duties of each position.

b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal

protective equipment and clothing to include selection, use and maintenance.

c. Confined Space Entry Plan. Develop a confined and/or enclosed space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive CPL 2.100, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

d. Crane Critical Lift Plan.

Prepare and sign weight handling critical lift plans for lifts over 75 percent of the capacity of the crane or hoist (or lifts over 50 percent of the capacity of a barge mounted mobile crane's hoists) at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks. Submit 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.H. and the following:

(1) For lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.1400.

e. Fall Protection and Prevention (FP&P) Program Documentation. The program documentation shall be site specific and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A qualified person for fall protection shall prepare and sign the program documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Revise the Fall Protection and Prevention Program documentation every six months for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Program documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Program documentation in the Accident Prevention Plan (APP).

The FP&P Plan shall include a Rescue and Evacuation Plan in accordance with USACE EM 385-1-1, Section 21.M. The plan shall include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan in the Fall Protection and Prevention (FP&P) Plan, and as part of the Accident Prevention Plan (APP).

f. Site Demolition Plan. The safety and health aspects prepared in accordance with referenced sources. Include engineering survey as applicable.

g. Excavation Plan. The safety and health aspects prepared in accordance with Section31 23 00.00 20 EXCAVATION AND FILL.

1.8 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1, Section 1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.9 DISPLAY OF SAFETY INFORMATION

Within one calendar day(s) after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, shall be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, section 01.A.06. Additional items required to be posted include:

a. Confined space entry permit.

b. Hot work permit.

1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.11 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.12 NOTIFICATIONS and REPORTS

1.12.1 Accident Notification

Notify the Contracting Officer as soon as practical, but no more than four hours after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $2,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property

damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

1.12.2 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, property damage accidents resulting in at least $20,000 in damages, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS. The Contracting Officer will provide copies of any required or special forms.

b. Near Misses: Complete the applicable documentation in NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS).

c. Conduct an accident investigation for any weight handling equipment accident (including rigging gear accidents) to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the contracting officer. The Contracting Officer will provide a blank copy of the accident report form.

1.12.3 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix I and as specified herein with Daily Reports of Inspections.

1.12.4 Certificate of Compliance

Provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). State within the certificate that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance comply with 29 CFR 1926 and USACE EM 385-1-1 Section 16 and Appendix I. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. Also certify that all of its crane operators working on the DOD activity have been trained in the proper use of all safety devices (e.g., anti-two block devices). Post certifications on the crane.

1.13 HOT WORK

Submit and obtain a written permit prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, from the Fire Division. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS

ISSUED. Provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency Fire Division phone number. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

1.14 RADIATION SAFETY REQUIREMENTS

License Certificates for radiation materials and equipment shall be submitted to the Contracting Officer and Radiation Safety Office (RSO), and Contracting Oversight Technician (COT) for all specialized and licensed material and equipment that could cause fatal harm to construction personnel or to the construction project.

Workers shall be protected from radiation exposure in accordance with 10 CFR 20. Standards for Protection Against Radiation

Loss of radioactive material shall be reported immediately to the Contracting Officer.

Actual exposure of the radiographic film or unshielding the source shall not be initiated until after 5 p.m. on weekdays.

In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, no assumptions shall be made as to building occupancy. Where necessary, the Contracting Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, a fully instructed employee shall be positioned inside such building or area to prevent exiting while external radiographic operations are in process. Transportation of Regulated Amounts of Radioactive Material will comply with 49 CFR, Subchapter C, Hazardous Material Regulations. Local Fire authorities and the site Radiation Safety officer (RSO) shall be notified of any Radioactive Material use.

Transmitter Requirements: The base policy concerning the use of transmitters such as radios, cell phones, etc., must be adhered to by all contractor personnel. They must also obey Emissions control (EMCON) restrictions.

1.15 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer.

1.16 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must:

a. Secure outside equipment and materials and place materials that could

be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

1.17 CONFINED SPACE ENTRY REQUIREMENTS.

Contractors entering and working in confined spaces while performing general industry work are required to follow the requirements of OSHA 29 CFR 1926 and comply with the requirements in Section 34 of EM 385-1-1, OSHA 29 CFR 1910, and OSHA 29 CFR 1910.146.

PART 2 PRODUCTS

2.1 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 5 feet.

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

Comply with USACE EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be carried/available on each person.

Mandatory PPE includes:

a. Hard Hat

b. Appropriate Safety Shoes

c. Reflective Vests

3.1.1 Hazardous Material Use

Each hazardous material must receive approval from the Contracting Office or their designated representative prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing

ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Ensure that each employee is familiar with and complies with these procedures and USACE EM 385-1-1, Section 12, Control of Hazardous Energy.

3.4 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

Establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with ASSE/SAFE Z359.1.

3.4.1 Training

Institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with USACE EM 385-1-1, Section 21.B.

3.4.2 Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, Paragraphs 21.N through 21.N.04. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500, Subpart M, USACE EM 385-1-1 and ASSE/SAFE A10.32.

3.4.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ASSE/SAFE Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 6 feet. The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.4.3 Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

   (1) For work within 6 feet of an edge, on low-slope roofs, protect personnel from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.

   (2) For work greater than 6 feet from an edge, erect and install warning lines in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.

b. Steep-Sloped Roofs: Work on steep-sloped roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3.4.4 Horizontal Lifelines

Design, install, certify and use under the supervision of a qualified person horizontal lifelines for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.4.5 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1 and 29 CFR 1926 Subpart M.

3.4.6 Rescue and Evacuation Procedures

When personal fall arrest systems are used, ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.5 SCAFFOLDING

Provide employees with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access scaffold platforms greater than 20 feet maximum in height by use of a scaffold stair system. Do not use vertical ladders commonly provided by scaffold system manufacturers for accessing scaffold platforms greater than 20 feet maximum in height. The use of an adequate gate is required. Ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. Give special care to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Place work platforms on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions. Additionally, when material handling equipment is used as a crane it must meet NAVFAC P-307 requirements in Sections 1.7.2, "Contractor Operated Cranes," and 12, "Investigation and Reporting of Crane and Rigging Gear Accidents."

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.6.2 Weight Handling Equipment

a. Equip cranes and derricks as specified in EM 385-1-1, section 16.

b. Notify the Contracting Officer 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated.Contractor's operator shall remain with the crane during the spot check.

c. Comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.

d. Comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, and ASME B30.8 for floating cranes and floating derricks.

e. Under no circumstance shall a Contractor make a lift at or above 90 percent of the cranes rated capacity in any configuration.

f. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and follow the requirements of USACE EM 385-1-1 Section 11, NAVFAC P-307 Figure 10-3 and ASME B30.5 or ASME B30.22 as applicable.

g. Do not crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane.

h. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

i. All employees must keep clear of loads about to be lifted and of suspended loads.

j. Use cribbing when performing lifts on outriggers.

k. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

l. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

m. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available

for review by Contracting Officer personnel.

n. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.

o. Certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

p. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. Prior to conducting lifting operations set a maximum wind speed at which a crane can be safely operated based on the equipment being used, the load being lifted, experience of operators and riggers, and hazards on the work site. This maximum wind speed determination shall be included as part of the activity hazard analysis plan for that operation.

3.6.3 Equipment and Mechanized Equipment

a. Proof of qualifications for operator shall be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment shall be on-site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Incorporate such additional safety precautions or requirements into the AHAs.

3.6.4 USE OF EXPLOSIVES

Explosives shall not be used or brought to the project site.

3.7 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

3.7.1 Utility Locations

All underground utilities in the work area must be positively identified by a third party, independent, private utility locating company in addition to any station locating service and coordinated with the station utility department.

3.7.2 Utility Location Verification

Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility

departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company shall locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.8 ELECTRICAL

3.9.1 Portable Extension Cords

Size portable extension cords in accordance with manufacturer ratings for the tool to be powered and protected from damage. Immediately removed from service all damaged extension cords. Portable extension cords shall meet the requirements of EM 385-1-1, NFPA 70E, and OSHA electrical standards.

3.9 WORK IN CONFINED SPACES

Comply with the requirements in Section 34 of USACE EM 385-1-1, OSHA 29 CFR 1910, OSHA 29 CFR 1910.146, OSHA Directive CPL 2.100 and OSHA 29 CFR 1926. Any potential for a hazard in the confined space requires a permit system to be used.

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 34 of USACE EM 385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.

c. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
08/10

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: http://www.concrete.org

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: http://www.aashto.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: http://www.aisc.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW,11th Floor
Washington, DC 20036

Ph: 202-293-8020
Fax: 202-293-9287
E-mail: info@ansi.org
Internet: http://www.ansi.org/

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: http://www.ashrae.org

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018-2187
Ph: 847-699-2929
Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: http://www.asse.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-347-0804
E-mail: smorrison@awwa.org
Internet: http://www.awwa.org

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: http://www.asme.org

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 North 18th Street
P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-2530
Fax: 205-257-2540
E-Mail: aeicdir@bellsouth.net
Internet: http://www.aeic.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: http://www.astm.org

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919

Ph: 401-275-3000 ext. 1945
Fax: 401-275-3029
E-mail: servicedesk.myrisk@fmglobal.com
Internet: http://www.fmglobal.com

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)
University of South California
Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032 or 866-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: http://www.usc.edu/dept/fccchr

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
E-mail: greenseal@greenseal.org
Internet: http://www.greenseal.org

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IES)
120 Wall Street, 17th Floor
New York, NY 10005
Ph: 212-248-5000
Fax: 212-248-5018
E-mail: IES@IES.org
Internet: http://www.IES.org

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane or 2001 L Street, NW. Suite 700
Piscataway, NJ 08855-1331 or Washington, DC 20036-4910 USA
Ph: 732-981-0060 or 800-701-4333
Fax: 732-562-6380
E-mail: onlinesupport@ieee.org or ieeeusa@ieee.org
Internet: http://www.ieee.org

INTERNATIONAL CODE COUNCIL (ICC)
5360 Workman Mill Road
Whittier, CA 90601
Ph: 562-699-0541
Fax: 562-699-8031
E-mail: webmaster@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
3050 Old Centre Ave. Suite 102
Portage, MI 49024
Ph: 269-488-6382
Fax: 269-488-6383
E-mail: neta@netaworld.org
Internet: http://www.netaworld.org

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

Ph: 703-841-3200
Fax: 703-841-5900
Internet: http://www.nema.org/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 or 800-344-3555
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: http://www.nfpa.org

THE SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS (SCTE)
140 Philips Road
Exton, PA 19341-1318
Ph: 800-542-5040 or 610-363-6888
Fax: 610-363-5898
E-Mail: scte@scte.org
http://www.scte.org

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTE)
3 Baker Avenue, 5th Floor
White Plains, New York 10601
Ph: 914-761-1100
Fax: 914-761-3115
E-mail: smpte@smpte.org
Internet: http://www.smpte.org

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)
Virginia Code Commission
General Assembly Building, 2nd Floor
910 Capitol Street
Richmond, Virginia 23219
Ph: 804-786-3591
Fax: 804-692-0625
E-mail: tlong@dls.virginia.gov (Tina Long)
Internet: http://register.dls.virginia.gov

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: http://www.sspc.org

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
1320 . Courthouse Rd., Suite 200
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: http://www.tiaonline.org

UNDERWRITERS LABORATORIES (UL)
2600 N.W. Lake Road
Camas, WA 98607-8542
Ph: 877-854-3577
Fax: 360-817-6278
E-mail: CEC.us@us.ul.com

Internet: http://www.ul.com/
UL Directories available through IHS at http://www.ihs.com

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)
2711 Villa Creek Drive, Suite 1000
Dallas, TX 75234
Ph: 972-243-3902
Fax: 972-243-3907
E-mail: info@uni-bell.org
Internet: http://www.uni-bell.org

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Order CRD-C DOCUMENTS from:
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http://www.hnc.usace.army.mil/Missions/Engineering/TECHINFO.aspx

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Fax: 704-852-4189
E-mail: seed.ams@usda.gov
Internet: http://www.ams.usda.gov/lsg/seed.htm
Order Other Publications from:
U.S. Department of Agriculture, Rural Utilities Service
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Washington, DC 20250
Ph: 202-720-2791
Fax: 202-720-2166
Internet: http://www.usda.gov/rus

U.S. DEPARTMENT OF DEFENSE (DOD)
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Internet: http://www.dod.gov
Obtain Military Specifications, Standards and Related Publications from:
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Department of Defense Single Stock Point (DODSSP)
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Building 4/D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: http://assist.daps.dla.mil/online/start/; account registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700
Washington, CD 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet: http://www.wbdg.org/references/docs_refs.php

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-272-0167
for Fax and E-mail see below
Internet: http://www.epa.gov
--- Some EPA documents are available only from:
National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6050 or 1-688-584-8332
Fax: 703-605-6900
E-mail: info@ntis.gov
Internet: http://www.ntis.gov

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)
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732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: http://www.gpoaccess.gov
Order free documents from:
Federal Aviation Administration
Department of Transportation
800 Independence Avenue, SW
Washington, DC 20591
Ph: 1-866-835-5322
Internet: http://www.faa.gov

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)
FHWA, Office of Safety
1200 New Jersey Ave., SE

Washington, DC 20590-
Ph: 202-366-0411
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)
General Services Administration
1800 F Street, NW
Washington, DC 20405
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Document Automation and Production Service (DAPS)
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700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: http://assist.daps.dla.mil/online/start/; account registration required

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
E-mail: contactcenter@gpo.gov
Internet: http://www.archives.gov
Order documents from:
Superintendent of Documents
U.S.Government Printing Office (GPO)
732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: http://www.gpoaccess.gov

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)
1322 Patterson Ave. SE, Suite 1000
Washington Navy Yard, DC 20374
Ph: 757-322-4200
Fax: 757-322-4416
Internet: http://www.navfac.navy.mil

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 45 00.10 20

QUALITY CONTROL FOR MINOR CONSTRUCTION
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

QC Plan; G

Submit a QC plan within 15 calendar days after receipt of Notice of Award.

1.3 INFORMATION FOR THE CONTRACTING OFFICER (KO)

Prior to commencing work on construction, the Contractor can obtain a single copy set of the current report forms from the KO. The report forms will consist of the Contractor Production Report, Contractor Production Report (Continuation Sheet), Contractor Quality Control (CQC) Report, CQC Report (Continuation Sheet), Preparatory Phase Checklist, Initial Phase Checklist, Rework Items List, and Testing Plan and Log.

Deliver the following to the KO:

a. CQC Report: Original and one copy, by 10:00 AM the next working day after each day that work is performed;

b. Contractor Production Report: Original and one copy by 10:00 AM the next working day after each day that work is performed;

c. Preparatory Phase Checklist: Original attached to the original CQC Report and one copy attached to each copy;

d. Initial Phase Checklist: Original attached to the original CQC Report and one copy attached to each copy;

e. Field Test Reports: One copy, within two working days after the test is performed, attached to the CQC Report;

f. QC Meeting Minutes: One copy, within two working days after the meeting; and

g. QC Certifications: As required by the paragraph entitled "QC Certifications."

1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. The QC program consists of a QC Manager, a QC plan, a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, and QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this contract. The QC program shall cover on-site and off-site work and shall be keyed to the work sequence. No work or testing may be performed unless the QC Manager is on the work site.

1.4.1 Preliminary Work Authorized Prior to Acceptance

The only work that is authorized to proceed prior to the acceptance of the QC plan is mobilization of storage and office trailers, temporary utilities, and surveying.

1.4.2 Acceptance

Acceptance of the QC plan is required prior to the start of construction. The KO reserves the right to require changes in the QC plan and operations as necessary, including removal of personnel, to ensure the specified quality of work. The KO reserves the right to interview any member of the QC organization at any time in order to verify the submitted qualifications.

1.4.3 Notification of Changes

Notify the KO, in writing, of any proposed change, including changes in the QC organization personnel, a minimum of seven calendar days prior to a proposed change. Proposed changes shall be subject to the acceptance by the KO.

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program. In addition to implementing and managing the QC program, the QC Manager may perform the duties of project superintendent. The QC Manager is required to attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by others.

1.5.1.2 Qualifications

An individual with a minimum of 10 years combined experience as a

superintendent, inspector, QC Manager, project manager, or construction manager on similar size and type construction contracts which included the major trades that are part of this contract. The individual must be familiar with the requirements of the EM 385-1-1 and have experience in the areas of hazard identification and safety compliance.

1.5.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager shall have completed the course Construction Quality Management for Contractors and will have a current certificate.

1.5.2 Alternate QC Manager Duties and Qualifications

Designate an alternate for the QC Manager to serve in the event of the designated QC Manager's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager shall be the same as for the QC Manager.

1.6 QC PLAN

1.6.1 Requirements

Provide, for acceptance by the KO, a QC plan submitted in a three-ring binder that covers both on-site and off-site work and includes the following with a table of contents listing the major sections identified with tabs.

I. QC ORGANIZATION: A chart showing the QC organizational structure and its relationship to the production side of the organization.

II. NAMES AND QUALIFICATIONS: In resume format, for each person in the QC organization. Include the CQM for Contractors course certification required by the paragraph entitled "Construction Quality Management Training".

III. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONAL: Of each person in the QC organization.

IV. OUTSIDE ORGANIZATIONS: A listing of outside organizations such as architectural and consulting engineering firms that will be employed by the Contractor and a description of the services these firms will provide.

V. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager and stating that they are responsible for managing and implementing the QC program as described in this contract. Include in this letter the QC Manager's authority to direct the removal and replacement of non-conforming work.

VI. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval.

VII. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraphs "Accredited Laboratories" or "Testing

Laboratory Requirements", as applicable.

VIII. TESTING PLAN AND LOG: A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.

IX. PROCEDURES TO COMPLETE REWORK ITEMS: Procedures to identify, record, track and complete rework items.

X. DOCUMENTATION PROCEDURES: Use Government formats.

XI. LIST OF DEFINABLE FEATURES: A Definable Feature of Work (DFOW) is a task, which is separate and distinct from other tasks, has the same control requirements and work crews. The list shall be cross-referenced to the Contractor's Construction Schedule and the specification sections. For projects requiring a Progress Chart, the list of definable features of work shall include but not be limited to all items of work on the schedule. For projects requiring a Network Analysis Schedule, the list of definable features of work shall include but not be limited to all critical path activities.

XII. PROCEDURES FOR PERFORMING THREE PHASES OF CONTROL: For each DFOW provide Preparatory and Initial Phase Checklists. Each list shall include a breakdown of quality checks that will be used when performing the quality control functions, inspections, and tests required by the contract documents. The preparatory and initial phases shall be conducted with a view towards obtaining quality construction by planning ahead and identifying potential problems.

XIII. PERSONNEL MATRIX: Not Applicable.

XIV. PROCEDURES FOR COMPLETION INSPECTION: See the paragraph entitled "COMPLETION INSPECTIONS".

XV. TRAINING PROCEDURES AND TRAINING LOG: Not Applicable.

1.7 COORDINATION AND MUTUAL UNDERSTANDING MEETING

During the Pre-Construction conference and prior to the start of construction, discuss the QC program required by this contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, and the coordination of the Contractor's management, production and the QC personnel. At the meeting, the Contractor will be required to explain how three phases of control will be implemented for each DFOW. Contractor's personnel required to attend shall include the QC Manager, project manager, and superintendent. Minutes of the meeting will be prepared by the QC Manager and signed by both the Contractor and the KO. The Contractor shall provide a copy of the signed minutes to all attendees. Repeat the coordination and mutual understanding meeting when a new QC Manager is appointed.

1.8 QC MEETINGS

After the start of construction, the QC Manager shall conduct QC meetings once every two weeks at the work site with the superintendent and the foreman responsible for the ongoing and upcoming work. The QC Manager

shall prepare the minutes of the meeting and provide a copy to the KO within two working days after the meeting. As a minimum, the following shall be accomplished at each meeting:

a. Review the minutes of the previous meeting;

b. Review the schedule and the status of work and rework;

c. Review the status of submittals;

d. Review the work to be accomplished in the next two weeks and documentation required;

e. Resolve QC and production problems (RFIs, etc.);

f. Address items that may require revising the QC plan; and

g. Review Accident Prevention Plan (APP).

1.9 THREE PHASES OF CONTROL

The three phases of control shall adequately cover both on-site and off-site work and shall include the following for each DFOW.

1.9.1 Preparatory Phase

Notify the KO at least two work days in advance of each preparatory phase. Conduct the preparatory phase with the superintendent and the foreman responsible for the definable feature of work. Document the results of the preparatory phase actions in the daily CQC Report and in the QC checklist. Perform the following prior to beginning work on each definable feature of work:

a. Review each paragraph of the applicable specification sections;

b. Review the contract drawings;

c. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;

d. Review the testing plan and ensure that provisions have been made to provide the required QC testing;

e. Examine the work area to ensure that the required preliminary work has been completed;

f. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data;

g. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted; and

h. Discuss specific controls used and the construction methods and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFOW.

1.9.2 Initial Phase

Notify the KO at least two work days in advance of each initial phase. When construction crews are ready to start work on a DFOW, conduct the Initial Phase with the foreman responsible for that DFOW. Observe the initial segment of the work to ensure that it complies with contract requirements. Document the results of the Initial Phase in the daily CQC Report and in the QC checklist. Perform the following for each DFOW:

a. Establish the quality of workmanship required;

b. Resolve conflicts;

c. Ensure that testing is performed by the approved laboratory; and

d. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

1.9.3 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary, until the completion of each DFOW and document in the daily CQC Report and in the QC checklist:

a. Ensure the work is in compliance with contract requirements;

b. Maintain the quality of workmanship required;

c. Ensure that testing is performed by the approved laboratory;

d. Ensure that rework items are being corrected; and

e. Assure manufacturers representatives have performed necessary inspections, if required.

1.9.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW is resumed after substantial period of inactivity, or if other problems develop.

1.9.5 Notification of Three Phases of Control for Off-Site Work

Notify the KO at least two weeks prior to the start of the preparatory and initial phases.

1.10 SUBMITTAL REVIEW AND APPROVAL

Procedures for submission, review, and approval of submittals are described in the submittal section of the specification.

1.11 TESTING

Except as stated otherwise in the specification sections, perform sampling and testing required under this contract.

1.11.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E 329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."

1.11.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology, the American Association of State Highway and Transportation Officials (AASHTO), International Accreditation Services, Inc. (IAS), U. S. Army Corps of Engineers Materials Testing Center (MTC), the American Association for Laboratory Accreditation (A2LA), the Washington Association of Building Officials (WABO) (Approval authority for WABO is limited to projects within Washington State), and the Washington Area Council of Engineering Laboratories (WACEL) (Approval authority by WACEL is limited to projects within the NAVFAC WASH and Public Works Center Washington geographical area).

1.11.3 Capability Check

The KO retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this contract.

1.11.4 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the KO immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results shall be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the KO.

1.12 QC CERTIFICATIONS

1.12.1 Contractor Quality Control Report Certification

Each CQC Report shall contain the following statement: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report."

1.12.2 Invoice Certification

Furnish a certificate to the KO with each payment request, signed by the QC Manager, attesting that as-built drawings are current and attesting that

the work for which payment is requested, including stored material, is in compliance with contract requirements.

1.12.3 Completion Certification

Upon completion of work under this contract, the QC Manager shall furnish a certificate to the KO attesting that "the work has been completed, inspected, tested and is in compliance with the contract."

1.13 COMPLETION INSPECTIONS

1.13.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Contract clause "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Include in the punch list any remaining items of the "Rework Items List", which were not corrected prior to the Punch-Out inspection. The punch list shall include the estimated date by which the deficiencies will be corrected. A copy of the punch list shall be provided to the KO. The QC Manager or staff shall make follow-on inspections to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.13.2 Pre-Final Inspection

The Government and QC manager will perform this inspection to verify that the facility is complete and ready to be occupied. A Government pre-final punch list may be developed as a result of this inspection. The QC Manager shall ensure that all items on this list are corrected prior to notifying the Government that a "Final" inspection with the customer can be scheduled. Any items noted on the "Pre-Final" inspection shall be corrected in a timely manner and shall be accomplished before the contract completion date for the work or any particular increment thereof if the project is divided into increments by separate completion dates.

1.13.3 Final Acceptance Inspection

The QC Manager, the superintendent, or other Contractor management personnel and the KO will be in attendance at this inspection. Additional Government personnel may be in attendance. The final acceptance inspection will be formally scheduled by the KO based upon results of the "Pre-Final Inspection". Notice shall be given to the KO at least 14 days prior to the final inspection. The notice shall state that all specific items previously identified to the Contractor as being unacceptable will be complete by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the KO to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause "Inspection of Construction".

1.14 DOCUMENTATION

Maintain current and complete records of on-site and off-site QC program operations and activities. The forms identified under the paragraph "INFORMATION FOR THE CONTRACTING OFFICER (KO)" shall be used. Reports are

required for each day work is performed. Account for each calendar day throughout the life of the contract. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. The reporting of work shall be identified by terminology consistent with the construction schedule. In the "remarks" section in this report which will contain pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site. For each remark given, identify the Schedule Activity No. that is associated with the remark.

1.14.1 Quality Control Validation

Establish and maintain the following in a series of three ring binders. Binders shall be divided and tabbed as shown below. These binders shall be readily available to the Government's Quality Assurance Team during all business hours.

a. All completed Preparatory and Initial Phase Checklists, arranged by specification section.

b. All milestone inspections, arranged by Activity/Event Number.

c. A current up-to-date copy of the Testing and Plan Log with supporting field test reports, arranged by specification section.

d. Copies of all contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.

e. A current up-to-date copy of the Rework Items List.

f. Maintain up-to-date copies of all punch lists issued by the QC Staff on the Contractor and Sub-Contractors and all punch lists issued by the Government.

1.14.2 As-Built Drawings

The QC Manager is required to review the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS, are kept current on a daily basis and marked to show deviations, which have been made from the Contract drawings. Ensure each deviation has been identified with the appropriate modifying documentation, e.g. PC number, modification number, RFI number, etc. The QC Manager shall initial each deviation or revision. Upon completion of work, the QC Manager shall submit a certificate attesting to the accuracy of the as-built drawings prior to submission to the KO.

1.15 NOTIFICATION ON NON-COMPLIANCE

The KO will notify the Contractor of any detected non-compliance with the foregoing requirements. The Contractor shall take immediate corrective action. If the contractor fails or refuses to correct the non-compliant work, the KO will issue a non compliance notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the KO may issue an order stopping all or part of the work

until satisfactory corrective action has been taken. The Contractor shall make no part of the time lost due to such stop orders the subject of claim for extension of time, for excess costs, or damages.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
08/09

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511	(2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(1988e9) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2009) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(Rev K) Obstruction Marking and Lighting

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2000) Manual of Uniform Traffic Control Devices

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submitted the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction site plan; G

Traffic control plan; G

SD-06 Test Reports

Backflow Preventer Tests; G

SD-07 Certificates

Backflow Tester Certification; G

Backflow Preventers Certificate of Full Approval

1.4 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.5 BACKFLOW PREVENTERS CERTIFICATE

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.5.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

1.5.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information

approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

2.1.2 Project and Safety Signs

The requirements for the signs, their content, and location are as required. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

At contractors expense construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.2.3 Fencing

a. Provide fencing along the construction site at all open excavations and tunnels to control access by unauthorized people. Fencing must be installed to be able to restrain a force of at least 250 pounds against it.

2.2.4 Temporary Wiring

Provide temporary wiring in accordance with NFPA 241 and NFPA 70, Article 305-6(b), Assured Equipment Grounding Conductor Program. Include frequent inspection of all equipment and apparatus.

2.2.5 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with 150 pound flanged cast iron, mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. The particular make, model/design, and size of backflow preventers to be installed must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a Certificate of Full Approval from FCCCHR List. After installation conduct Backflow Preventer Tests and provide test

reports verifing that the installation meets the FCCCHR Manual Standards.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the government installation.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Utilities at Special Locations

a. Reasonable amounts of utilities will be made available to the Contractor at the prevailing Government rates. These rates may be obtained upon application to the Commanding Officer, NAVFAC Midlant, by way of the Contracting Officer. The Contractor will be responsible for making connections, providing transformers and meters, and making disconnections; and for providing backflow preventer devices on connections to domestic water lines.

3.2.3 Sanitation

a. Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal, district, or commercial sanitary sewer system. Any penalties and / or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times without nuisance. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

3.2.4 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.2.5 Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 100 feet above ground level. Light construction and installation must comply with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

3.2.6 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

3.3.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

3.3.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer.

3.3.4 Commercial Vehicles In/Out of NAVSTA/NAS Norfolk, VA

a. Definitions. Commercial vans and trucks are differentiated as follows:

(1) Closed truck. A truck enclosed on four sides, top, and bottom to which entry can be made only through end or side doors and to which a seal can be applied.

(2) Open truck. A truck which is either fully open, such as flatbed,

or contained by wooden slats or sideboards; or any truck to which a seal cannot be applied.

(3) Commercial vehicles. A common contract or commercial truck without a decal issued by Norfolk, VA.

(4) Trailer. A non-self-propelled enclosed cargo container used for the transportation of goods, e.g., a trailer pulled by a truck.

b. Instructions and directions. Ensure that commercial trucks and trailers follow the instructions below to provide for effective control over their entry and exit from the base, movement within the base, and to reduce congestion both at the gates and within the base. In general, commercial trucks and common carriers are required to enter and exit through specified gates and process immediately to a truck control point for cargo manifest check. The driver shall be issued a Material Movement Control and Gate Pass, routing instructions, and directions to depart the base via a designated exit point where the pass is to be turned in.

(1) Common contract and commercial trucks going to the area of Building LP-84 (MAC Terminal), NAS Norfolk shall enter and exit Gate 22. Gate 22 hours of operations are 5:30 a.m. through 6:30 p.m. and 10:30 p.m. through 3:00 a.m., 7 days a week. The gate is closed on holidays.

(2) Other common contract and commercial trucks, except as noted below are allowed to enter the Naval Base through any Gate and exit through Gate 2.

(3) Common contract and commercial trucks which enter the base may depart through Gate 5, Gate 4, and Gate 22 only. The exit Truck Control Point at Gate 4 is operated from 7:00 a.m. to 5:00 p.m.

(4) For concrete- and asphalt-carrying trucks, the Resident Officer in Charge of Construction (ROICC), Norfolk VA shall arrange entry and exit through any gate other than Gate 2.

(5) Contractor vehicles with black Norfolk Naval Base decals shall be granted routine access to the base at all times. These trucks shall not enter or exit the base through Gate 2. These trucks are subject to random checks and searches at exit gates like other personal and commercial vehicles to ensure that Government property is not being taken off the base without authorization and documentation.

c. Movement and Exit

(1) Material movement control and gate pass. A Material Movement Control and Gate Pass (5ND GEN 5510/1) is required for the removal of Government, public, or private property from NAVSTA and NAS Norfolk complex via commercial vans and truck.

(a) The Material Movement Control and Gate Pass shall be originated by the Naval Base Police Truck Control Officer, and shall be given to drivers of commercial trucks for retention during transit to intermediate stops and to the exit gates. The pass shall be presented by the driver to the Truck Control Officer at the exit truck stop. If the driver has more than one delivery

or pickup point, the driver shall present the pass at each stop so the new activity may fill in appropriate information on the pass. A copy of the pass shall be retained by each activity after appropriate information has been entered; remaining copies of the pass shall be returned to the driver. Passes are subject to review by the Naval Base Police Department during transit and within command areas by activity officials for verification of cargo content and to determine if drivers are transiting promptly and by the proper route. For trailers expecting to be picked up and depart outside normal working hours, pre-prepared passes shall be provided by the activity duty officer or authorized supervising person prior to close of working hours. Trucking companies expecting to pick up trailers after working hours should be instructed to pick up a Material Movement Control and Gate Pass from the responsible activity. The activity duty officer or official shall notify Base Police Headquarters to clear the truck for exit at Gate 5 if the seal and Material Movement Control and Gate Pass are in order.

(b) When filling out a Material Movement Control and Gate Pass, the last activity where business is conducted on the base is responsible to ensure that the original of the pass is given to the driver to turn in to the Truck Control officer at the truck control stops.

(c) The Material Movement Control and Gate Pass shall be turned in by the vehicle driver to a base police officer at a truck control stop when he departures from the base.

(d) Government or commercial vehicles departing Naval Base, Norfolk with Government, public, or private property shall possess a Material Movement Control and Gate Pass filled out by a naval officer or equivalent grade civilian within the driver's chain of command. The Material Movement Control and Gate Pass shall be inspected and verified during random gate departure searches.

(2) Car Seals

(a) Commercial, sealable, closed trailers and trucks, full, partially full, or empty, destined to leave the base shall be sealed upon departure from any activity. The seal number and trailer or truck number shall be entered on the Material Movement Control and Gate Pass.

(b) Commercial closed trailers and trucks received empty for loading with Government material shall have a Navy car seal affixed to cargo doors after loading and prior to departing through designated gates.

(c) Closed trailers and trucks which have been only partially loaded or off-loaded shall be sealed completely at the end of working hours with a Navy car seal.

(d) Application of Navy car seals is the responsibility of the activity in charge of loading and unloading of trailers and trucks.

(e) The Naval Station Police Department will conduct random checks of contents, seals, and forms of trailers and trucks on the Naval Base complex.

(f) A truck driver whose van or truck does not have a properly completed Material Movement Control and Gate Pass or car seal will be refused exit clearance.

3.4 CONTRACTOR'S TEMPORARY FACILITIES

3.4.1 Safety

Protect the integrity of any installed safety systems or personnel safety devices. If entrance into systems serving safety devices is required, the Contractor must obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.4.2 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

3.4.3 Storage Area

Construct a temporary 8 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store Trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

3.4.4 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor is responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

3.4.5 Appearance of Trailers

a. Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on installation property.

3.4.6 Trailers or Storage Buildings

a. Trailers or storage buildings will be permitted, where space is available, subject to the approval of the Contracting Officer. The trailers or buildings shall be in good condition, free from visible damage rust and deterioration, and meet all applicable safety requirements. Trailers shall be roadworthy and comply with all appropriate state and local vehicle requirements. Failure to maintain storage trailers or buildings to these standards shall result in the removal of non-complying units at the Contractor's expense. A sign not smaller than 24 by 24 inches shall be conspicuously placed on the trailer depicting the company name, business phone number, and emergency phone number. Trailers shall be anchored to resist high winds and must meet applicable state of local standards for anchoring mobile trailers.

b. LANTNAVFACENGCOM Trailer Sign. A sign shall be mounted on the trailer or building that shows the company name, phone number, emergency phone number and conforms to the following requirements and sketch :

Graphic panel: Aluminum, painted blue

Copy: Screen painted or vinyl die-cut, white

Typeface: Univers 65 u/lc

See Sketch No. 01500 (graphic).

3.4.7 Maintenance of Storage Area

a. Keep fencing in a state of good repair and proper alignment. Grassed or unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor's discretion. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

3.4.8 Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

3.4.9 Storage Size and Location

The site available for storage must be within 1,000 feet of the operations area.

3.4.10 Storage in Existing Buildings

The Contractor will be working around existing buildings; the storage of material will not be allowed in these buildings.

3.4.11 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.4.11.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

3.4.11.2 Hurricane Condition of Readiness

Unless directed otherwise, comply with:

a. Condition FOUR (Sustained winds of 50 knots or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all debris, trash, or objects that could become missile hazards. Contact Contracting Officer for Condition of Readiness (COR) updates and completion of required actions.

b. Condition THREE (Sustained winds of 50 knots or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.

c. Condition TWO (Sustained winds of 50 knots or greater expected within 24 hours): Curtail or cease routine activities until securing operation is complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas. Contact Contracting Officer for weather and Condition of Readiness (COR) updates and completion of required actions.

d. Condition ONE. (Sustained winds of 50 knots or greater expected within 12 hours): Secure the jobsite, and leave Government premises.

3.5 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located

that operation by normal voice between these elements is not satisfactory, the Contractor must install a satisfactory means of communication, such as telephone or other suitable devices and made available for use by Government personnel.

3.6 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, will become the property of the Contractor and be removed from the work site.

3.7 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store within the fenced area described above or at the supplemental storage area any materials resulting from demolition activities which are salvageable. Neatly stacked stored materials not in trailers, whether new or salvaged.

3.8 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haulroads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore to the original or better condition, areas used by the Contractor for the storage of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 57 19.00 20

TEMPORARY ENVIRONMENTAL CONTROLS
11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004	(1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions

40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 271	Requirements for Authorization of State Hazardous Waste Programs
40 CFR 272	Approved State Hazardous Waste Management Programs
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 355	Emergency Planning and Notification
40 CFR 372-SUBPART D	Specific Toxic Chemical Listings
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.2 Solid Waste

Garbage, refuse, debris, sludge, or other discharged material, including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations. Types of solid waste typically generated at construction sites may include:

a. Green waste: The vegetative matter from landscaping, land clearing and

grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

b. Surplus soil: Existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included.

c. Debris: Non-hazardous solid material generated during the construction, demolition, or renovation of a structure which exceeds 2.5 inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

d. Wood: Dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated and/or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included.

e. Scrap metal: Scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

f. Paint cans: Metal cans that are empty of paints, solvents, thinners and adhesives. If permitted by the paint can label, a thin dry film may remain in the can.

g. Recyclables: Materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable. Metal meeting the definition of lead contaminated or lead based paint contaminated may be included as recyclable if sold to a scrap metal company. Paint cans may not be included as recyclable if sold to a scrap metal company.

h. Hazardous Waste: By definition, to be a hazardous waste a material must first meet the definition of a solid waste. Hazardous waste and hazardous debris are special cases of solid waste. They have additional regulatory controls and must be handled separately. They are thus defined separately in this document.

Material not regulated as solid waste are: nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.3 Hazardous Debris

As defined in Solid Waste paragraph, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) per 40 CFR 261; or debris that exhibits a characteristic of

hazardous waste per 40 CFR 261.

1.2.4 Chemical Wastes

This includes salts, acids, alkalizes, herbicides, pesticides, and organic chemicals.

1.2.5 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2.6 Hazardous Waste

Any discarded material, liquid, solid, or gas, which meets the definition of hazardous material or is designated hazardous waste by the Environmental Protection Agency or State Hazardous Control Authority as defined in 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 271, 40 CFR 272, 40 CFR 273, 40 CFR 279, and 40 CFR 280.

1.2.7 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

Hazardous material is any material that:

a. Is regulated as a hazardous material per 49 CFR 173, or

b. Requires a Material Safety Data Sheet (MSDS) per 29 CFR 1910.120, or

c. During end use, treatment, handling, packaging, storage, transpiration, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D.

Designation of a material by this definition, when separately regulated or controlled by other instructions or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this instruction for "control" purposes. Such material include ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs). Nonetheless, the exposure may occur incident to manufacture, storage, use and demilitarization of these items.

1.2.8 Waste Hazardous Material (WHM)

Any waste material which because of its quantity, concentration, or physical, chemical, or infectious characteristics may pose a substantial hazard to human health or the environment and which has been so designated. Used oil not containing any hazardous waste, as defined above, falls under this definition.

1.2.9 Oily Waste

Those materials which are, or were, mixed with used oil and have become separated from that used oil. Oily wastes also means materials, including

wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, used oil and may be appropriately tested and discarded in a manner which is in compliance with other State and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that:

a. It is not prohibited in other State regulations or local ordinances

b. The amount generated is "de minimus" (a small amount)

c. It is the result of minor leaks or spills resulting from normal process operations

d. All free-flowing oil has been removed to the practical extent possible

Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, a hazardous waste determination must be performed prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.10 Regulated Waste

Those solid waste that have specific additional Federal, state, or local controls for handling, storage, or disposal.

1.2.11 Class I Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act and includes the following chemicals:

chlorofluorocarbon-11 (CFC-11)
chlorofluorocarbon-12 (CFC-12)
chlorofluorocarbon-13 (CFC-13)
chlorofluorocarbon-111 (CFC-111)
chlorofluorocarbon-112 (CFC-112)
chlorofluorocarbon-113 (CFC-113)
chlorofluorocarbon-114 (CFC-114)
chlorofluorocarbon-115 (CFC-115)
chlorofluorocarbon-211 (CFC-211)
chlorofluorocarbon-212 (CFC-212)

chlorofluorocarbon-213 (CFC-213)
chlorofluorocarbon-214 (CFC-214)
chlorofluorocarbon-215 (CFC-215)
chlorofluorocarbon-216 (CFC-216)
chlorofluorocarbon-217 (CFC-217)
chlorofluorocarbon-500 (CFC-500)
chlorofluorocarbon-502 (CFC-502)
chlorofluorocarbon-503 (CFC-503)
halon-1211
halon-1301
halon-2402
carbon tetrachloride
methyl bromide
methyl chloroform

Class II ODS is defined in Section 602(s) of The Clean Air Act and includes the following chemicals:

hydrochlorofluorocarbon-21 (HCFC-21)
hydrochlorofluorocarbon-22 (HCFC-22)
hydrochlorofluorocarbon-31 (HCFC-31)
hydrochlorofluorocarbon-121 (HCFC-121)
hydrochlorofluorocarbon-122 (HCFC-122)
hydrochlorofluorocarbon-123 (HCFC-123)
hydrochlorofluorocarbon-124 (HCFC-124)
hydrochlorofluorocarbon-131 (HCFC-131)
hydrochlorofluorocarbon-132 (HCFC-132)
hydrochlorofluorocarbon-133 (HCFC-133)
hydrochlorofluorocarbon-141 (HCFC-141)

hydrochlorofluorocarbon-142 (HCFC-142)
hydrochlorofluorocarbon-221 (HCFC-221)
hydrochlorofluorocarbon-222 (HCFC-222)
hydrochlorofluorocarbon-223 (HCFC-223)
hydrochlorofluorocarbon-224 (HCFC-224)
hydrochlorofluorocarbon-225 (HCFC-225)
hydrochlorofluorocarbon-226 (HCFC-226)
hydrochlorofluorocarbon-231 (HCFC-231)
hydrochlorofluorocarbon-232 (HCFC-232)
hydrochlorofluorocarbon-233 (HCFC-233)
hydrochlorofluorocarbon-234 (HCFC-234)
hydrochlorofluorocarbon-235 (HCFC-235)
hydrochlorofluorocarbon-251 (HCFC-251)
hydrochlorofluorocarbon-252 (HCFC-252)
hydrochlorofluorocarbon-253 (HCFC-253)
hydrochlorofluorocarbon-261 (HCFC-261)
hydrochlorofluorocarbon-262 (HCFC-262)
hydrochlorofluorocarbon-271 (HCFC-271)

1.2.11.1 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (e.g., thermostats) and lamps (e.g., fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey; G

Solid Waste Management Plan and Permit; G

Regulatory Notifications; G

Environmental Management Plan; G

Storm Water Pollution Prevention Plan; G

Storm Water Notice of Intent (for NPDES coverage under the general permit for construction activities); G

Dirt and Dust Control Plan

Contractor Hazardous Material Inventory Log; G

SD-06 Test Reports

Laboratory Analysis

Erosion and Sediment Control Inspection Reports

Storm Water Inspection Reports for General Permit

Contractor 40 CFR employee training records

Solid Waste Management Report; G

SD-11 Closeout Submittals

Some of the records listed below are also required as part of other submittals. For the "Records" submittal, maintain on-site a separate three-ring Environmental Records binder and submit at the completion of the project. Make separate parts to the binder corresponding to each of the applicable sub items listed below.

Storm Water Pollution Prevention Plan compliance notebook; G

Waste Determination Documentation

Disposal Documentation for Hazardous and Regulated Waste

Contractor 40 CFR Employee Training Records

Solid Waste Management Permit

Solid Waste Management Report

Contractor Hazardous Material Inventory Log; G

Hazardous Waste/Debris Management

Regulatory Notifications

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction

practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

The Contractor may be required to promptly conduct tests and procedures for the purpose of assessing whether construction operations are in compliance with Applicable Environmental Laws. Analytical work shall be done by qualified laboratories; and where required by law, the laboratories shall be certified.

1.4.1 Environmental Compliance Assessment Training and Tracking System (ECATTS)

The QC Manager is responsible for environmental compliance on projects unless an Environmental Manager is named. The QC Manager (and alternative QC Manager) or Environmental Manager shall complete ECATTS training prior to starting respective portions of on-site work under this contract. If personnel changes occur for any of these positions after starting work, replacement personnel shall complete ECATTS training within 14 days of assignment to the project

Submit an ECATTS certificate of completion for personnel who have completed the required "Environmental Compliance Assessment Training and Tracking System (ECATTS)" training. This training is web-based and can be accessed from any computer with Internet access using the following instructions.

Register for NAVFAC Environmental Compliance Training and Tracking System, by logging on to http://navfac.ecatts.com/. Obtain the password for registration from the Contracting Officer.

This training has been structured to allow contractor personnel to receive credit under this contract and also to carry forward credit to future contracts. Contractors shall ensure that the QC Manager (and alternate QC Manager) or Environmental Manager review their training plans for new modules or updated training requirements prior to beginning work. Some training modules are tailored for specific State regulatory requirements; therefore, Contractors working in multiple states will be requires to re-take modules tailored to the state where the contract work is being performed.

ECATTS is available for use by all contractor and subcontractor personnel associated with this project. These other personnel are encouraged (but not required) to take the training and may do so at their discretion.

1.4.2 Conformance with the Environmental Management System

The Contractor shall perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). The Contractor shall perform work in a manner that conforms to objectives and targets, environmental programs and operational controls identified by the EMS. The Contractor will provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, the Contractor shall take corrective and/or preventative

actions. In addition, the Contractor shall ensure that its employees are aware of their roles and responsibilities under the EMS and how these EMS roles and responsibilities affect work performed under the contract.

The Contractor is responsible for ensuring that their employees receive applicable environmental and occupational health and safety training, and keep up to date on regulatory required specific training for the type of work to be conducted onsite. All on-site Contractor personnel, and their subcontractor personnel, performing tasks that have the potential to cause a significant environmental impact shall be competent on the basis of appropriate education, training or experience. Upon contract award, the Contracting Officer's Representative will notify the installation's EMS coordinator to arrange EMS training. The installation's EMS coordinator shall identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. The Contractor shall provide training documentation to the Contracting Officer. The EMS coordinator shall retain associated records.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey

Perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record.

1.5.2 Regulatory Notifications

The Contractor is responsible for all regulatory notification requirements in accordance with Federal, State and local regulations. In cases where the Navy must also provide public notification (such as stormwater permitting), the Contractor must coordinate with the Contracting Officer. The Contractor shall submit copies of all regulatory notifications to the Contracting Officer prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all inclusive): demolition, renovation, NPDES defined site work, remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the activity; types and quantities of wastes/wastewater that may be generated during the contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and activity environmental staff to discuss the proposed Environmental Management Plan. Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, required permits, permit requirements, and other measures to be taken.

1.5.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager will be directly responsible for coordinating contractor compliance with Federal, State, local, and station

requirements. The Environmental Manager will ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the Environmental Management Plan; ensure that all environmental permits are obtained, maintained, and closed out; ensure compliance with Storm Water Program Management requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure all Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out.

1.5.5 Contractor 40 CFR Employee Training Records

Prepare and maintain employee training records throughout the term of the contract meeting applicable 40 CFR requirements. The Contractor will ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with Federal, State and local regulatory requirements for RCRA Large Quantity Generator. The Contractor will provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in 40 CFR 265 for a Large Quantity Generator facility. Submit these training records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 ENVIRONMENTAL MANAGEMENT PLAN

Prior to initiating any work on site, the Contractor will meet with the Contracting Officer to discuss the proposed Environmental Protection Plan and develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, and other measures to be taken. The Contractor's Environmental Plan shall incorporate construction related objectives and targets from the installation's Environmental Management System. The Environmental Management Plan will be submitted in the following format and shall include the elements specified below.

a. Description of the Environmental Management Plan

(1) General overview and purpose

(a) A brief description of each specific plan required by environmental permit or elsewhere in this contract.

(b) The duties and level of authority assigned to the person(s) on the job site that oversee environmental compliance.

(c) A copy of any standard or project specific operating procedures that will be used to effectively manage and protect the environment on the project site.

(d) Communication and training procedures that will be used to convey environmental management requirements to contractor employees and subcontractors.

(e) Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

(2) General site information

(3) A letter signed by an officer of the firm appointing the Environmental Manager and stating that he/she is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

b. Management of Natural Resources

(1) Land resources

(2) Tree protection

(3) Replacement of damaged landscape features

(4) Temporary construction

c. Protection of Historical and Archaeological Resources

(1) Objectives

(2) Methods

d. Storm Water Management and Control

(1) Ground cover

(2) Erodible soils

(3) Temporary measures

(a) Mechanical retardation and control of runoff

(b) Vegetation and mulch

(4) Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Protection of the Environment from Waste Derived from Contractor Operations

(1) Control and disposal of solid and sanitary waste. If Section 01 74 19.05 20 is included in the contract, submit the plan required

by that section as part of the Environmental Management Plan.

(2) Control and disposal of hazardous waste (Hazardous Waste Management Section)

This item will consist of the management procedures for all hazardous waste to be generated. The elements of those procedures will coincide with the Activity Hazardous Waste Management Plan. A copy of the Activity Hazardous Waste Management Plan will be provided by the Contracting Officer. As a minimum, include the following:

(a) Procedures to be employed to ensure a written waste determination is made for appropriate wastes which are to be generated;

(b) Sampling/analysis plan;

(c) Methods of hazardous waste accumulation/storage (i.e., in tanks and/or containers);

(d) Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted);

(e) Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268);

(f) Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and the like;

(g) Used oil management procedures in accordance with 40 CFR 279;

(h) Pollution prevention\hazardous waste minimization procedures;

(i) Plans for the disposal of hazardous waste by permitted facilities;

(j) Procedures to be employed to ensure all required employee training records are maintained.

f. Prevention of Releases to the Environment

(1) Procedures to prevent releases to the environment

(2) Notifications in the event of a release to the environment

g. Regulatory Notification and Permits

List what notifications and permit applications must be made. Demonstrate that those permits have been obtained by including copies of all applicable, environmental permits.

3.1.1 Environmental Protection Plan Review

Within thirty days after the Contract award date, submit the proposed Environmental Management Plan for further discussion, review, and approval. Commencement of work will not begin until the environmental

management plan has been approved.

3.1.2 Licenses and Permits

Obtain licenses and permits pursuant to the "Permits and Responsibilities" FAR Clause 52.236-7.

No permits will be obtained by the Contracting Officer.

Where required by the State regulatory authority, the inspections and certifications will be provided through the services of a Professional Engineer (PE), registered in the State where the work is being performed. Where a PE is not required, the individual must be otherwise qualified by other current State licensure, specific training and prior experience (minimum 5 years). As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a sub item containing the name, appropriate professional registration or licence number, address, and telephone number of the professionals or other qualified persons who will be performing the inspections and certifications for each permit.

3.2 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified. If the work is near streams, lakes, or other waterways, conform to the national permitting requirements of the Clean Water Act.

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor will be responsible for any resultant damage.

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed. Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

3.2.1 Erosion and Sediment Control Measures

Refer to Specification Section 01 57 19.01 20 SUPPLEMENTAL RTEMPORARY ENVIRONMENTAL CONTROLS.3.2.2 Erosion and Sediment Control Inspection Reports

Submit "Erosion and Sediment Control Inspection Reports" (E&S) and Storm Water Inspection Reports for General Permit for General Permit to the Contracting Officer.

3.2.2.1 Storm Water Notice of Intent for Construction Activities and Storm Water Pollution Prevention Plan

The Contractor shall submit a Storm Water Notice of Intent (for NPDES coverage under the general permit for construction activities) and a Storm

Water Pollution Prevention Plan (SWPPP). Refer to Specification Section 01 57 19.01 20 SUPPLEMENTAL RTEMPORARY ENVIRONMENTAL CONTROLS.

3.2.2.2 Storm Water Pollution Prevention Plan Compliance Notebook

Refer to Specification Section 01 57 19.01 20 SUPPLEMENTAL RTEMPORARY ENVIRONMENTAL CONTROLS.

3.2.3 Stormwater Drainage and Construction Dewatering

Refer to Specification Section 01 57 19.01 20 SUPPLEMENTAL RTEMPORARY ENVIRONMENTAL CONTROLS.

3.3 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Upon discovery, notify the Contracting Officer. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work. The Government retains ownership and control over historical and archaeological resources.

3.4 SOLID WASTE MANAGEMENT PLAN and PERMIT

Provide to the contracting officer written notification of the quantity of solid waste/debris that is anticipated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance or as applicable, submit one copy of a State and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

3.4.1 Solid Waste Management Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

The Contractor will include copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, the Contractor may submit a statement indicating the disposal location for the solid waste which is signed by an officer of the Contractor firm authorized to legally obligate or bind the firm. The sales documentation or Contractor certification will include the receiver's tax identification number and business, EPA or State registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained by the Contractor for his own use, the Contractor will submit on the solid waste disposal report the information previously described in this paragraph. Prices paid or received will not be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.4.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Recycling is

encouraged and can be coordinated with the Contracting Officer and the activity recycling coordinator. Remove all solid waste (including non-hazardous debris) from Government property and dispose off-site at an approved landfill. Solid waste disposal off-site must comply with most stringent local, State, and Federal requirements including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage spent hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, as per environmental law.

3.4.2.1 Dumpsters

Equip dumpsters with a secure cover and paint the standard base color. Keep cover closed at all times, except when being loaded with trash and debris. Locate dumpsters behind the construction fence or out of the public view. Empty site dumpsters at least once a week. or as needed to keep the site free of debris and trash. If necessary, provide 55 gallon trash containers painted the darker base color to collect debris in the construction site area. Locate the trash containers behind the construction fence or out of the public view. Empty trash containers at least once a day. For large demolitions, large dumpsters without lids are acceptable but should not have debris higher than the sides before emptying.

3.5 WASTE DETERMINATION DOCUMENTATION

Complete a Waste Determination form (provided at the pre-construction conference) for all contractor derived wastes to be generated. Base the waste determination upon either a constituent listing from the manufacturer used in conjunction with consideration of the process by which the waste was generated, EPA approved analytical data, or laboratory analysis (Material Safety Data Sheets (MSDS) by themselves are not adequate). Attach all support documentation to the Waste Determination form. As a minimum, a Waste Determination form must be provided for the following wastes (this listing is not all inclusive): oil and latex based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and all containers of the original materials.

3.6 CONTRACTOR HAZARDOUS MATERIAL INVENTORY LOG

Submit the "Contractor Hazardous Material Inventory Log"(found at: http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf), which provides information required by (EPCRA Sections 312 and 313) along with corresponding Material Safety Data Sheets (MSDS) to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Documentation for any spills/releases, environmental reports or off-site transfers may be requested by the Contracting Officer.

3.6.1 Disposal Documentation for Hazardous and Regulated Waste

Manifest, pack, ship and dispose of hazardous or toxic waste and universal waste that is generated as a result of construction in accordance with the generating facilities generator status under the Recourse Conservation and Recovery Act. Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or State permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of

hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifest must be reviewed, signed, and approved by the Navy before the Contractor may ship waste. To obtain specific disposal instructions the Contractor must coordinate with the Activity environmental office.

3.7 POLLUTION PREVENTION/HAZARDOUS WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of hazardous waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the Environmental Management Plan. Consult with the activity Environmental Office for suggestions and to obtain a copy of the installation's pollution prevention/hazardous waste minimization plan for reference material when preparing this part of the plan. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the types of the hazardous materials expected to be used in the construction when requesting information.

3.8 WHM/HW MATERIALS PROHIBITION

No waste hazardous material or hazardous waste shall be disposed of on government property. No hazardous material shall be brought onto government property that does not directly relate to requirements for the performance of this contract. The government is not responsible for disposal of Contractor's waste material brought on the job site and not required in the performance of this contract. The intent of this provision is to dispose of that waste identified as waste hazardous material/hazardous waste as defined herein that was generated as part of this contract and existed within the boundary of the Contract limits and not brought in from offsite by the Contractor. Incidental materials used to support the contract including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive. The Contractor is not authorized to discharge any materials to sanitary sewer, storm drain, or to the river or conduct waste treatment or disposal on government property without written approval of the Contracting Officer.

3.9 HAZARDOUS MATERIAL MANAGEMENT

No hazardous material shall be brought onto government property that does not directly relate to requirements for the performance of this contract.

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Submit a MSDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on base. Typical materials requiring MSDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. At the end of the project, provide the Contracting Officer with the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used. Ensure that hazardous materials are utilized in a manner that will minimize the amount of hazardous waste that is generated. Ensure that all containers of hazardous materials have NFPA labels or their equivalent. Keep copies of the MSDS for hazardous materials on site at all times and provide them to the Contracting Officer at the end of the

project. Certify that all hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste per 40 CFR 261.

3.10 PETROLEUM PRODUCTS AND REFUELING

Conduct the fueling and lubricating of equipment and motor vehicles in a manner that protects against spills and evaporation. Manage all used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while on-site exhibits a characteristic of hazardous waste. Used oil containing 1000 parts per million of solvents will be considered a hazardous waste and disposed of at Contractor's expense. Used oil mixed with a hazardous waste will also be considered a hazardous waste.

3.10.1 Oily and Hazardous Substances

Prevent oil or hazardous substances from entering the ground, drainage areas, or navigable waters. In accordance with 40 CFR 112, surround all temporary fuel oil or petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tanks, plus 10 percent freeboard for precipitation. The berm will be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs.

3.10.2 Inadvertent Discovery of Petroleum Contaminated Soil or Hazardous Wastes

If petroleum contaminated soil or suspected hazardous waste is found during construction that was not identified in the contract documents, the contractor shall immediately notify the contracting officer. The contractor shall not disturb this material until authorized by the contracting officer.

3.11 FUEL TANKS

Petroleum products and lubricants required to sustain up to 30 days of construction activity may be kept on site. Storage and refilling practices shall comply with 40 CFR Part 112. Secondary containment shall be provided and be no less than 110 percent of the tank volume plus five inches of free-board. If a secondary berm is used for containment then the berm shall be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Drips pans are required and the tanks must be covered during inclement weather.

3.12 RELEASES/SPILLS OF OIL AND HAZARDOUS SUBSTANCES

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated by environmental law. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Base or Activity Fire Department, the activity's Command Duty Officer, and the Contracting Officer. If the contractor's response is inadequate, the Navy may respond. If this should occur, the contractor

will be required to reimburse the government for spill response assistance and analysis.

The Contractor is responsible for verbal and written notifications as required by the federal 40 CFR 355, State, local regulations and Navy Instructions. Spill response will be in accordance with 40 CFR 300 and applicable State and local regulations. Contain and clean up these spills without cost to the Government. If Government assistance is requested or required, the Contractor will reimburse the Government for such assistance. Provide copies of the written notification and documentation that a verbal notification was made within 20 days.

Maintain spill cleanup equipment and materials at the work site. Clean up all hazardous and non-hazardous (WHM) waste spills. The Contractor shall reimburse the government for all material, equipment, and clothing generated during any spill cleanup. The Contractor shall reimburse the government for all costs incurred including sample analysis materials, equipment, and labor if the government must initiate its own spill cleanup procedures, for Contractor responsible spills, when:

a. The Contractor has not begun spill cleanup procedure within one hour of spill discovery/occurrence, or

b. If, in the government's judgment, the Contractor's spill cleanup is not adequately abating life threatening situation and/or is a threat to any body of water or environmentally sensitive areas.

3.13 CONTROL AND MANAGEMENT OF HAZARDOUS WASTES

3.13.1 Facility Hazardous Waste Generator Status

Naval Station, Norfolk is designated as a Large Quantity Generator . All work conducted within the boundaries of this activity must meet the regulatory requirements of this generator designation. The Contractor will comply with all provisions of Federal, State and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of all construction derived wastes.

3.13.2 Hazardous Waste/Debris Management

Identify all construction activities which will generate hazardous waste/debris. Provide a documented waste determination for all resultant waste streams. Hazardous waste/debris will be identified, labeled, handled, stored, and disposed of in accordance with all Federal, State, and local regulations including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Hazardous waste will also be managed in accordance with the approved Hazardous Waste Management Section of the Environmental Protection Plan. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities will be identified as being generated by the Government.

Prior to removal of any hazardous waste from Government property, all hazardous waste manifests must be signed by activity personnel from the Station Environmental Office. No hazardous waste will be brought onto Government property. Provide to the Contracting Officer a copy of waste determination documentation for any solid waste streams that have any

potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D. For hazardous wastes spills, verbally notify the Contracting Officer immediately.

3.13.2.1 Regulated Waste Storage/Satellite Accumulation/90 Day Storage Areas

If the work requires the temporary storage/collection of regulated or hazardous wastes, the Contractor will request the establishment of a Regulated Waste Storage Area, a Satellite Accumulation Area, or a 90 Day Storage Area at the point of generation. The Contractor must submit a request in writing to the Contracting Officer providing the following information:

Contract Number	_____
Contractor	_____
Haz/Waste or Regulated Waste POC	_____
Phone Number	_____
Type of Waste	_____
Source of Waste	_____
Emergency POC	_____
Phone Number	_____
Location of the Site	_____

(Attach Site Plan to the Request)

Attach a waste determination form. Allow ten working days for processing this request. The designated area where waste is being stored shall be barricaded and a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.13.2.2 Sampling and Analysis of HW

a. Waste Sampling

Sample waste in accordance with EPA 530/F-93/004. Each sampled drum or container will be clearly marked with the Contractor's identification number and cross referenced to the chemical analysis performed.

b. Laboratory Analysis

Follow the analytical procedure and methods in accordance with the 40 CFR 261. The Contractor will provide all analytical results and reports performed to the Contracting Officer

c. Analysis Type

Identify waste hazardous material/hazardous waste by analyzing for

the following properties as a minimum: ignitability, corrosiveness, total chlorides, BTU value, PCBs, TCLP for heavy metals, and cyanide.

3.13.2.3 Asbestos Certification

Items, components, or materials disturbed by or included in work under this contract do involve asbestos. Other materials in the general area around where work will be performed may contain asbestos. All thermal insulation, in all work areas, should be considered to be asbestos unless positively identified by conspicuous tags or previous laboratory analysis certifying them as asbestos free.

Inadvertent discovery of non-disclosed asbestos that will result in an abatement action requires a change in scope before proceeding. Upon discovery of asbestos containing material not identified in the contract documents, the Contractor shall immediately stop all work that would generate further damage to the material, evacuate the asbestos exposed area, and notify the Contracting Officer for resolution of the situation prior to resuming normal work activities in the affected area. The Contractor will not remove or perform work on any asbestos containing materials without the prior approval of the Contracting Officer. The Contractor will not engage in any activity, which would remove or damage such materials or cause the generation of fibers from such materials.

Asbestos containing waste shall be managed and disposed of in accordance with applicable environmental law. Asbestos containing waste shall be manifested and the manifest provided to the Contracting Officer.

3.13.2.4 Hazardous Waste Disposal

No hazardous, toxic, or universal waste shall be disposed or hazardous material abandoned on government property. And unless otherwise noted in this contract, the government is not responsible for disposal of Contractor generated waste material. The disposal of incidental materials used to accomplish the work including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive.

The Contractor is not authorized to discharge any materials to sanitary sewer, storm drain, or water way or conduct waste treatment or disposal on government property without written approval of the Contracting Officer.

Control of stored waste, packaging, sampling, analysis, and disposal will be determined by the details in the contract. The requirements for jobs in the following paragraphs will be used as the guidelines for disposal of any hazardous waste generated.

a. Responsibilities for Contractor's Disposal

Contractor responsibilities include any generation of WHM/HW requiring Contractor disposal of solid waste or liquid.

(1) The Contractor agrees to provide all service necessary for the final treatment/disposal of the hazardous material/waste in accordance with all local, State and Federal laws and regulations, and the terms and conditions of the contract within sixty (60) days after the materials have been generated. These services will

include all necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal, and/or transportation, including manifesting or completing waste profile sheets, equipment, and the compilation of all documentation is required).

(2) Contain all waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 272, 40 CFR 273, 40 CFR 279, 40 CFR 280, and 40 CFR 761.

(3) Obtaining a representative sample of the material generated for each job done to provide waste stream determination.

(4) Analyzing for each sample taken and providing analytical results to the Contracting Officer. Provide two copies of the results.

(5) Determine the DOT proper shipping names for all waste (each container requiring disposal) and will demonstrate how this determination is developed and supported by the sampling and analysis requirements contained herein to the Contracting Officer.

Contractor Disposal Turn-In Requirements

For any waste hazardous materials or hazardous waste generated which requires the Contractor to dispose of, the following conditions must be complied with in order to be acceptable for disposal:

a. Drums compatible with waste contents and drums meet DOT requirements for 49 CFR 173 for transportation of materials.

b. Drums banded to wooden pallets. No more than three (3) 55 gallon drums to a pallet, or two (2) 85 gallon over packs.

c. Band using 1-1/4 inch minimum band on upper third of drum.

d. Recovery materials label (provided by Code 106.321) located in middle of drum, filled out to indicate actual volume of material, name of material manufacturer, other vendor information as available.

e. Always have three (3) to five (5) inches of empty space above volume of material. This space is called 'outage'.

3.13.3 Class I ODS Prohibition

Class I ODS as defined and identified herein will not be used in the performance of this contract, nor be provided as part of the equipment. This prohibition will be considered to prevail over any other provision, specification, drawing, or referenced documents. Regulations related to the protection of stratosphere ozone may be found in 40 CFR 82.

Heating and air conditioning technicians must be certified through an EPA-approved program. Copies of certifications shall be maintained at the employees' place of business and be carried as a wallet card by the technician, as provided by environmental law. Accidental venting of a refrigerant is a release and shall be reported to the Contracting Officer.

3.13.3.1 Universal Waste/e-Waste Management

Universal waste including but not limited to some mercury containing building products such as florescent lamps, mercury vapor lamps, high pressure sodium lamps, CRTs, batteries, aerosol paint containers, electrical equipment containing PCBs, and consumed electronic devices, shall be managed in accordance with applicable environmental law and installation instructions.

3.14 DUST CONTROL

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.14.1 Dirt and Dust Control Plan

Submit truck and material haul routes along with a plan for controlling dirt, debris, and dust on base roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

3.15 NOISE

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives will not be permitted. Confine pile-driving operations to the period between 8 a.m. and 4 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

3.16 MERCURY MATERIALS

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed. Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Cleanup of a mercury spill shall not be recycled and shall be managed as a hazardous waste for disposal.

-- End of Section --

SECTION 01 57 19.01 20

SUPPLEMENTAL TEMPORARY ENVIRONMENTAL CONTROLS
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. If state or local references are not provided here, refer to Section 01 57 19.00 20 TEMPORARY ENVIRONMENTAL CONTROLS for appropriate references.

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 25-840	Title 9, Agency 25, Chapter 840: Erosion And Sediment Control Regulations
9 VAC 25-850	Title 9, Agency 25, Chapter 850: Erosion And Sediment Control And Stormwater Management Certification Regulations
9 VAC 25-870	Title 9, Agency 25, Chapter 870: Virginia Stormwater Management Program (Vsmp) Regulation

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 833-R-060-04	(2007) Developing Your Storm Water Pollution Prevention Plan, a Guide for Construction Sites

1.2 MID-ATLANTIC

1.2.1 Virginia

1.2.1.1 Definition and Disposal Requirements of Empty Paint Cans

Paint Cans: Paint cans that are empty (free of liquids and contains less than 1 inch of dried material) of paints, solvents, thinners and adhesives may be disposed of in dumpsters.

Metal paint cans that meet the empty standard can be placed in dumpsters marked "metal only"; plastic cans may be placed in solid waste dumpsters. Manage paint cans with liquid or more than 1 inch of solidified oil-based paint as a hazardous waste and properly label. Manage paint cans with excess water-based paint as non-hazardous waste. Contact NAVFAC MIDLANT Environmental Services for management requirements.

1.2.1.2 Erosion and Sediment Control Measures and Stormwater Management

1.2.1.2.1 Erosion and Sediment Control

The land disturbance for this project will be 10,000 square feet or greater. An Erosion and Sediment Control Plan has been prepared, submitted, and approved by the Virginia Department of Environmental Quality. This plan will be provided to the Contractor prior to construction. Comply with the

requirements specified in the Virginia Erosion and Sediment Control Law and Regulations. (Virginia Code: 9 VAC 25-840) Obtain a Certificate of Competency in accordance with 9 VAC 25-850.

1.2.1.2.2 Construction Dewatering

There must be no release of construction discharge water to the stormwater system or into State waters without prior authorization in writing from the Environmental Division. Construction Dewatering must not be discharged to the sanitary sewer system. The discharge of hazardous substances is not permitted under any circumstances.

Construction site stormwater runoff must be treated through the use of proper erosion control measures or stormwater management practices prior to release from the construction site. Pollutants, including but not limited to chemicals, fuels, lubricants, sewage, paints, sedimentation, and other harmful materials must not be discharged into or alongside any River, Stream, or Impoundment, or into any channels leading to them. Contractors must implement appropriate erosion and sediment control measures to all disturbed areas or bare soils to prevent unauthorized offsite sedimentation. Denuded portions of a project which are at final grade or where work has temporarily ceased must have stabilization measures applied within 7 days.

1.2.1.3 Virginia Stormwater Management

The land disturbance for this project exceeds one acre. A Stormwater Management Plan has been prepared, submitted, and approved by the Virginia Department of Environmental Quality. This plan will be provided to the Contractor prior to construction. Comply with the requirements specified in the Virginia Stormwater Management Law and Regulations (Virginia Code: 9 VAC 25-870). Obtain Certificate of Competency in accordance with 9 VAC 25-850.

1.2.1.3.1 Storm Water General Permit for Construction Activities Registration Statement

In accordance with 9 VAC 25-870, submit a Registration Statement to the State to obtain Virginia Stormwater Management Program General Permit coverage, and as required under the General Permit, develop a Storm Water Pollution Prevention Plan (SWPPP) for the project. The SWPPP must meet the requirements of the State General Permit for storm water discharges from construction activities. Submit the Registration Statement and appropriate permit fees to the appropriate State agency for approval a minimum of 15 calendar days prior to the start of any land disturbing activities. Maintain an approved copy of the SWPPP at the construction on-site office, and continually update as regulations require, reflecting current site conditions.

Coverage under this permit requires the contractor to prepare a SWPPP, prepare and submit a Registration Statement and provide the permit fee to the responsible state agency before any land disturbing activities begin. The Contractor must file for permit coverage on behalf of both them and the Construction Officer, and file a Notice of Termination once construction is complete and the site is stabilized with a final sustainable cover. Under the terms and conditions of the permit, the Contractor may be required to install, inspect, maintain best management practices (BMPs), and submit stormwater BMP inspection reports and stormwater pollution prevention plan inspection reports. Ensure construction operations and management are

constantly in compliance with the terms and conditions of the general permit for storm water discharges from construction activities.

1.2.1.3.2 Storm Water Pollution Prevention Plan Notebook

Create and maintain a three-ring binder of documents that demonstrate compliance with the Stormwater Construction Activity permit. The binder must include a copy of the permit Registration Statement, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports, copies of correspondence with the appropriate state agency and a copy of the permit Notice of Termination. At the completion of the project, the completed binder becomes the property of the Government. Provide the completed binder to the Contracting Officer. Provide an advance copy of the Registration Statement to the Contracting Officer immediately after the form is presented to the permitting agency.

The SWPPP must be consistent with the requirements of the General Permit, and at a minimum included:

a. Identify potential sources of pollution which may be reasonably expected to affect the quality of storm water discharge from the site.

b. Describe and ensure implementation of practices which must be used to reduce the pollutants in storm water discharge from the site.

c. Ensure compliance with terms of the State general permit for storm water discharges.

d. Select applicable best management practices from EPA 833-R-060-04 or appropriate State guidance documents.

e. Include a completed copy of the Registration Statement, State permit coverage letter, BMP Inspection Report Template and Notice of Termination except for the effective date.

f. Include copy of the approved Erosion and Sediment Control Plan and copy of the approved Stormwater Management Plan.

1.2.1.3.3 Stormwater General Permit Inspection Reports

Complete and document, in the Stormwater Pollution Prevention Plan Notebook, the Storm Water Inspection Reports as required by the State VSMP General Permit. The Stormwater inspections reports must include all items required by the General Permit and must be completed at the inspection frequency detailed in 9 VAC 25-870. Obtain certificate of competency in accordance with 9 VAC 25-850.

1.2.1.4 Hazardous Waste Requirements for Virginia Installations:

1.2.1.4.1 Demolition

Ensure building has been surveyed for asbestos. Notify the Environmental Protection Agency (EPA) and Virginia Department of Labor and Industry (VADOLI) at least 10 working days before start of demolition. This notification is required for all demolition, even if no asbestos is present. Follow asbestos notification requirements in accordance with paragraph ASBESTOS ABATEMENT AND NOTIFICATION PROCEDURES. Implement Best Management Practices (BMPs) to contain dust and debris emissions to the air.

Remove the following items from the site prior to demolition: PCB's, fluorescent bulbs, mercury and metal components (such as furnaces, ducts, and piping), and any hazardous materials. Manage all lead, fluorescent bulbs, mercury containing equipment, and any other waste as "hazardous or universal waste" as appropriate (see paragraph HAZARDOUS AND UNIVERSAL WASTE GENERATION). If the demolition activity encompasses the whole building (the building will be demolished to the ground), the resulting construction debris (including lead paint) requires Toxicity Characteristic Leaching Procedure (TCLP) analysis to make a waste determination and ensure proper management and disposal before it can be disposed as solid waste.

1.2.1.4.2 Hazardous and Universal Waste Generation

Hazardous and Universal Waste includes fluorescent bulbs, PCB ballast, lead paint, and mercury containing equipment. Contact the EV Hazardous Waste (HW) Program Manager to set up an appropriate accumulation area. Manage waste in a SAA, HWAA, or UWAA as directed by HW Program Manager. Keep all containers securely closed unless adding or removing material/waste. Ensure custodians managing the accumulation area(s) have appropriate training that has been taken within the year prior to the area being established. Training is an annual requirement that can be taken on the ECATTS site (https://navfac.ecatts.com/start). Keep copies of training records/certificates on site.

Hazardous Waste Accumulation Areas (less than 90 day sites) require Virginia Department of Environmental Quality (VDEQ) notification. Notification to VDEQ is made by the EV HW Program Manager. Notify the HW MM 14 days prior to the start of waste accumulation. All agency notifications will originate from the Regional Environmental. A copy of the Activity Hazardous Material Reutilization, Hazardous Waste Minimization and Disposal Guide will be provided by the Contracting Officer. For waste disposal, phone the NAVFAC MIDLANT Environmental Service Desk to arrange pick up in your area. Fax a completed DD 1348-1A to the Service Desk for all waste turn-ins. Notify the Service Desk if any containers are leaking or are in poor condition.

1.2.1.4.3 Excavation

If soil is to be reused on site, sampling is not required unless otherwise directed. Excavated soil may be re-used within the construction site with no testing necessary. Soil may be stockpiled until the end of the project, then re-used as much as possible prior to sampling/analysis for residual soil to be disposed of. Store all in a manner that prevents rain from infiltrating the soil matrix and preventing any runoff into the surrounding soil or pavement (e.g. store the soil on top of plastic sheets and covered with plastic sheets or in lined, covered dumpsters). If the soil is going to be relocated or disposed outside the construction site, sampling and analysis is required. Contact the installation HW Program Manager prior to disposal to determine the appropriate sampling/ test parameters. Soil disposal requirements will depend on test results. If soil is to be shipped to a destination outside the fire ant quarantine area (outside of James City County, York County, Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach or Williamsburg) it MUST have a valid inspection certificate issued by an Officer of the Plant Protection and Quarantine Program (PPQ) of the U.S. Department of Agriculture. Contact the EV Pest Management Coordinator for additional information.

Sub-surface archaeological resources can be encountered unexpectedly. During any soil disturbing activities, should historic or prehistoric

artifacts, buried features, or structural foundations be discovered, halt the action and contact the NAVFAC MIDLANT Regional Historic Preservation Officer and the Contracting Officer immediately.

1.2.1.4.4 Painting and Paint Removal

Air drying cans for disposal is allowed only if liquid residue is less than 1 inch; keeping all paint or solvent containers closed and secured when not adding or removing material or waste. Waste paint chips/debris must be collected and sampled to determine proper disposal method. Contact the EV HW Program Manager for sampling requirements. If waste paint is determined to be hazardous, waste must be managed as hazardous and an appropriate accumulation area must be established. Contact the EV HW Program Manager for site setup.

Implement BMPs to contain dust and debris emissions to the air.

1.2.1.4.5 Dumpsters

Keep cover closed at all times, except when being loaded with trash and debris. Empty site dumpsters at least once a week or as needed to keep the site free of debris and trash. Label trash containers to appropriately describe the contents.

1.2.1.5 Air Requirements:

1.2.1.5.1 Concrete Crushing

Secure an air permit for the crusher from the regulatory agency where the equipment is home-based (in Virginia contact VADEQ). Provide a copy of the permit to the environmental office (Air Manager) through the Contracting Officer at least 30 days prior to bringing crusher on- site.

Utilize Best Management Practices (BMPs) (such as water suppression) during crushing operations to minimize dust and debris emissions to the air. Consider other environmental program requirements such as Clean Water Act (CWA) requirements when making decisions in regard to BMPs.

1.2.1.5.2 Painting

Control volatile organic compound emissions by keeping all paint, solvent, and waste containers closed/secured except when adding or removing material or waste. Control air emissions via air drying cans for disposal only if liquid residue is less than 1 inch.

Control particulate matter emissions by using containment such as shrouds to contain overspray during spraying operations.

1.2.1.5.3 Paint Removal

Control dust, abrasive agent, paint chips, and other debris during abrasive blasting or similar operations that could emit dust/debris. Containment could include application of water and use of shrouding/containment. Consider other environmental program requirements such as Clean Water Act (CWA) requirements when making decisions in regard to BMPs.

1.2.1.6 Hazardous Material Management

At the end of the project, provide the Contracting Officer with the maximum

quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used.

1.2.1.7 Spill Response and Reporting

Spills include any spilling, leaking, pumping, emitting, discharging, injecting, escaping, leaching, disposing, or dumping of liquid or solid material that is not authorized in writing by the Contracting Officer. Report all Spills at Hampton Roads Navy installations to the appropriate installation ECC immediately upon discovery. The Responsible party will fund all clean up and disposal costs.

After notification of installation ECC, notify your Navy point of contact. Refer to the Activity Hazardous Material Reutilization, Hazardous Waste Minimization and Disposal Guide Appendix 3 for spill contact procedures. Refer to "Table 1 - Spill Reporting Contact Numbers" for the appropriate point of contact.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 1609	(2001) Development and Implementation of a Pollution Prevention Program

1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.3 MANAGEMENT

Develop and implement a waste management program in accordance with ASTM E 1609 and as specified. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records

1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting. At a minimum, environmental and waste management goals and issues shall be discussed at the following additional meetings:

a. Pre-bid meeting.

b. Preconstruction meeting.

c. Regular QC meetings.

d. Work safety meetings.

1.6 WASTE MANAGEMENT PLAN

A waste management plan shall be submitted within 15 days after contract award and not less than 10 days before the preconstruction meeting. The plan shall demonstrate how the project waste diversion goal shall be met and shall include the following:

a. Name of individuals on the Contractor's staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

e. Characterization, including estimated types and quantities, of the waste to be generated.

f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

g. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and

phone number for each reuse facility to be used, and provide a copy of the permit or license for each facility.

h. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number, including a copy of the permit or license for each facility.

i. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.

j. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.

k. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

l. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

1.7 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Quantities may be measured by weight or by volume, but must be consistent throughout. List each type of waste separately noting the disposal or diversion date. Identify the landfill, recycling center, waste processor, or other organization used to process or receive the solid waste. Provide explanations for any waste not recycled or reused. With each application for payment, submit updated documentation for solid waste disposal and diversion, and submit manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

1.8 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to

subcontractors. Recycling and waste bin areas are to be kept neat and clean, and recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations. Separate materials by one of the following methods:

1.8.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted as described below into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate to the project waste and to the available recycling and reuse programs in the project area:

a. Land clearing debris.

b. Asphalt.

c. Concrete and masonry.

d. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).

(1) Ferrous.

(2) Non-ferrous.

e. Wood (nails and staples allowed).

f. Debris.

g. Glass (colored glass allowed).

h. Paper.

(1) Bond.

(2) Newsprint.

(3) Cardboard and paper packaging materials.

i. Plastic.

(1) Type 1: Polyethylene Terephthalate (PET, PETE).

(2) Type 2: High Density Polyethylene (HDPE).

(3) Type 3: Vinyl (Polyvinyl Chloride or PVC).

(4) Type 4: Low Density Polyethylene (LDPE).

(5) Type 5: Polypropylene (PP).

(6) Type 6: Polystyrene (PS).

(7) Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

j. Gypsum.

k. Carpet.

l. Ceiling tiles.

m. Insulation.

1.8.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.8.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.9 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.9.1 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling. All fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site shall be recycled. Arrange for timely pickups from the site or deliveries to recycling facilities in order to prevent contamination of recyclable materials.

1.9.2 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

1.9.3 Return

Set aside and protect misdelivered and substandard products and materials and return to supplier for credit.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005) Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37	(2000; R 2009) Industrial and Institutional Cleaners

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-300-08	(2009, with Change 2) Criteria for Transfer and Acceptance of DoD Real Property

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan

Final Cleaning

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

SD-11 Closeout Submittals

As-Built Drawings

Interim Form DD1354; G

Checklist for Form DD1354; G

1.3 PROJECT RECORD DOCUMENTS

1.3.1 As-Built Drawings

The Contractor shall maintain at the job site one set of full-size prints of the contract drawings, accurately marked in red with adequate dimensiions, to show all variations between the construction actually provided and that indicated or specified in the contract documents, including buried or concealed construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the final government-accepted drawings. Existing utility lines and features revealed during the course of contruction, shall also be accureately located and dimensioned. Variations in the interior utility systems shall be clearly defined and dimensioned; and coordinated with exterior utility connections at the building five-foot line, where applicable. Existing topographic features which differ from those shown on the contract drawings shall also be accurately located and recorded. Where a choice of materials or methods is permitted herein, or where variations in scope or character of methods is permitted herein, or where variations in scope or character of work from that of the original contract are authorized, the drawings shall be marked to define the construction actually provided. The representations of such changes shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as necessary to clearly portray the as-built construction. These drawings shall be available for review by the Contracting Officer at all times. Upon completion of the work, the set of marked up prints shall be certified as correct, signed by the Contractor, and delivered to the Cotracting Officer in electronic PDF format (full size at 300dpi minimum resolution)for his approval before acceptance. Requests for partial payments will not be approved if the marked prints are not kept current, and request for final payment will not be approved until the marked prints are delivered to the Cotracting Officer.

1.3.2 Construction Contract Specifications

Furnish one electronic PDF final copy of the (as-built) construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.4 WARRANTY MANAGEMENT

1.4.1 Warranty Management Plan

At least 30 days before the planned pre-warranty conference, submit one set set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of project acceptance and continue for the full product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contractor, Contracting

Officer and the Customer Representative. Include within the warranty management plan , but not limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subContractors, manufacturers or suppliers involved.

b. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

c. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

d. A list for each warranted equipment, item, feature of construction or system indicating:

(1) Name of item.
(2) Model and serial numbers.
(3) Location where installed.
(4) Name and phone numbers of manufacturers or suppliers.
(5) Names, addresses and telephone numbers of sources of spare parts.
(6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
(7) Cross-reference to warranty certificates as applicable.
(8) Starting point and duration of warranty period.
(9) Summary of maintenance procedures required to continue the warranty in force.
(10) Cross-reference to specific pertinent Operation and Maintenance manuals.
(11) Organization, names and phone numbers of persons to call for warranty service.
(12) Typical response time and repair time expected for various warranted equipment.

e. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

f. Procedure and status of tagging of all equipment covered by extended warranties.

g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.4.2 Performance Bond

The Contractor's Performance Bond must remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited

to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.4.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.5 OPERATION AND MAINTENANCE MANUALS

Submit 6 copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

1.5.1 Configuration

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

1.5.2 Training and Instruction

Submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. These services must be directed by the Contractor, using the manufacturer's

factory-trained personnel or qualified representatives. Contracting Officer will be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, must be made available to the Contracting Officer.

1.6 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean debris from drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with the Waste Management Plan. Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the project site.

1.7 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete and submit an accounting of all installed property with Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations from the Draft DD Form 1354. Contact the Contracting Officer for any project specific information necessary to complete the DD Form 1354. Refer to UFC 1-300-08 for instruction on completing the DD Form 1354. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site:
http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf

Submit the completed Checklist for Form DD1354 of Installed Building Equipment items. Attach this list to the updated DD Form 1354.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA
07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors must compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor must compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections must use Data Package 3. Commissioned items with a Data Package 1 or 2 requirement must use instead Data Package 3.

1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data must be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.2.4 Review and Approval

The Contractor's Commissioning Authority (CA) must review the commissioned systems and equipment submittals for completeness and applicability. The CA must verify that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CA must communicate deficiencies to the Contracting Officer. Upon a successful review of the corrections, the CA must recommend approval and acceptance of these O&M manuals to the Contracting Officer. This work is in addition to the normal review procedures for O&M data.

1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

a. Narrative description on how to perform and apply all functions,

features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.

b. Full as-built sequence of operations.

c. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).

d. Full points list. A listing of rooms shall be provided with the following information for each room:

(1) Floor

(2) Room number

(3) Room name

(4) Air handler unit ID

(5) Reference drawing number

(6) Air terminal unit tag ID

(7) Heating and/or cooling valve tag ID

(8) Minimum cfm

(9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Electronic File:

(1) Assemble each manual into a composite electronically indexed file in PDF format. Provide HDD’s, DVD's or CD's as appropriate, so that each one contains all maintenance and record files, and also the Project Record Documents and Training Videos, of the entire program for this facility.

(2) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

(3) Link the index to separate files within the composite of files. Book mark maintenance and record files, that have a Table of Contents, according to the Table of Contents

h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.5.1 Data Package 1

a. Safety precautions

b. Cleaning recommendations

c. Maintenance and repair procedures

d. Warranty information

e. Contractor information

f. Spare parts and supply list

1.5.2 Data Package 2

a. Safety precautions

b. Normal operations

c. Environmental conditions

d. Lubrication data

e. Preventive maintenance plan and schedule

f. Cleaning recommendations

g. Maintenance and repair procedures

h. Removal and replacement instructions

i. Spare parts and supply list

j. Parts identification

k. Warranty information

l. Contractor information

1.5.3 Data Package 3

a. Safety precautions

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Environmental conditions

g. Lubrication data

h. Preventive maintenance plan and schedule

i. Cleaning recommendations

j. Troubleshooting guides and diagnostic techniques

k. Wiring diagrams and control diagrams

l. Maintenance and repair procedures

m. Removal and replacement instructions

n. Spare parts and supply list

o. Product submittal data

p. O&M submittal data

q. Parts identification

r. Warranty information

s. Testing equipment and special tool information

t. Testing and performance data

u. Contractor information

1.5.4 Data Package 4

a. Safety precautions

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Operator service requirements

g. Environmental conditions

h. Lubrication data

i. Preventive maintenance plan and schedule

j. Cleaning recommendations

k. Troubleshooting guides and diagnostic techniques

l. Wiring diagrams and control diagrams

m. Maintenance and repair procedures

n. Removal and replacement instructions

o. Spare parts and supply list

p. Corrective maintenance man-hours

q. Product submittal data

r. O&M submittal data

s. Parts identification

t. Warranty information

u. Personnel training requirements

v. Testing equipment and special tool information

w. Testing and performance data

x. Contractor information

1.5.5 Data Package 5

a. Safety precautions

b. Operator prestart

c. Start-up, shutdown, and post-shutdown procedures

d. Normal operations

e. Environmental conditions

f. Preventive maintenance plan and schedule

g. Troubleshooting guides and diagnostic techniques

h. Wiring and control diagrams

i. Maintenance and repair procedures

j. Removal and replacement instructions

k. Spare parts and supply list

l. Product submittal data

m. Manufacturer's instructions

n. O&M submittal data

o. Parts identification

p. Testing equipment and special tool information

q. Warranty information

r. Testing and performance data

s. Contractor information

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 02 84 16

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 20-60	Title 9, Agency 20, Chapter 60: Hazardous Waste Management Regulations
9 VAC 20-80	Title 9, Agency 20, Chapter 80: Solid Waste Management Regulations

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 273	Standards For Universal Waste Management
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 178	Specifications for Packagings

1.2 REQUIREMENTS

Removal and disposal of PCB containing lighting ballasts and associated mercury-containing lamps. Contractor may encounter leaking PCB ballasts.

1.3 DEFINITIONS

1.3.1 Certified Industrial Hygienist (CIH)

A industrial hygienist hired by the contractor shall be certified by the American Board of Industrial Hygiene.

1.3.2 Leak

Leak or leaking means any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

1.3.3 Lamps

Lamp, also referred to as "universal waste lamp", is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

1.3.4 Polychlorinated Biphenyls (PCBs)

PCBs as used in this specification shall mean the same as PCBs, PCB containing lighting ballast, and PCB container, as defined in 40 CFR 761, Section 3, Definitions.

1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

1.3.6 Universal Waste

Universal Waste means any of the following hazardous wastes that are managed under the universal waste requirements 40 CFR 273:

(1) Batteries as described in Sec. 273.2 of this chapter;
(2) Pesticides as described in Sec. 273.3 of this chapter;
(3) Thermostats as described in Sec. 273.4 of this chapter; and
(4) Lamps as described in Sec. 273.5 of this chapter.

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

Perform PCB related work in accordance with 40 CFR 761 and 9 VAC 20-60 and 9 VAC 20-80. Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and 9 VAC 20-60 and 9 VAC 20-80.

1.4.2 Training

Certified industrial hygienist (CIH) shall instruct and certify the training of all persons involved in the removal of PCB containing lighting ballasts and mercury-containing lamps. The instruction shall include: The dangers of PCB and mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations. The CIH shall review and approve the PCB and Mercury-Containing Lamp Removal Work Plans.

1.4.3 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of 29 CFR 1910.1000, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 265, 40 CFR 268, 40 CFR 270, 40 CFR 273 and 9 VAC 20-60 9 VAC 20-80 and of the Contractor removal work plan and disposal plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Qualifications of CIH; G

Training Certification; G

PCB and Lamp Removal Work Plan; G

PCB and Lamp Disposal Plan; G

SD-11 Closeout Submittals

Transporter certification of notification to EPA of their PCB waste activities and EPA ID numbers; G

Certification of Decontamination

Certificate of Disposal and/or recycling. Submit to the Government before application for payment within 30 days of the date that the disposal of the PCB and mercury-containing lamp waste identified on the manifest was completed.

1.6 ENVIRONMENTAL REQUIREMENTS

Use special clothing:

a. Disposable gloves (polyethylene)

b. Eye protection

c. PPE as required by CIH

1.7 SCHEDULING

Notify the Contracting Officer 20 days prior to the start of PCB and mercury-containing lamp removal work.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of CIH

Submit the name, address, and telephone number of the Industrial Hygienist selected to perform the duties in paragraph entitled "Certified Industrial Hygienist." Submit training certification that the Industrial Hygienist is certified, including certification number and date of certification or re certification.

1.8.2 PCB and Lamp Removal Work Plan

Submit a job-specific plan within 20 calendar days after award of contract of the work procedures to be used in the removal, packaging, and storage of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan: Requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking and restroom procedures. The plan shall be approved and signed by the Certified Industrial Hygienist. Obtain approval of the plan by the Contracting Officer prior to the start of PCB and/or lamp removal work.

1.8.3 PCB and Lamp Disposal Plan

Submit a PCB and lamp Disposal Plan with 45 calendar days after award of contract. The PCB and Lamp Disposal Plan shall comply with applicable requirements of federal, state, and local PCB and Universal waste regulations and address:

a. Estimated quantities of wastes to be generated, disposed of, and recycled.

b. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location. Furnish two copies of EPA and state PCB and mercury-containing lamp waste permit applications and EPA identification numbers, as required.

c. Names and qualifications (experience and training) of personnel who will be working on-site with PCB and mercury-containing lamp wastes.

d. Spill prevention, containment, and cleanup contingency measures to be implemented.

e. Work plan and schedule for PCB and mercury-containing lamp waste removal, containment, storage, transportation, disposal and or recycling. Wastes shall be cleaned up and containerize daily.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lamps in accordance with local, state, or federal regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps.

3.1.1 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262 40 CFR 263, and the applicable requirements of this section, including but not limited to:

a. Obtaining suitable PCB and mercury-containing lamp storage sites.

b. Notifying Contracting Officer prior to commencing the operation.

c. Reporting leaks and spills to the Contracting Officer.

d. Cleaning up spills.

e. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.

f. Maintaining inspection, inventory and spill records.

3.2 PCB SPILL CLEANUP REQUIREMENTS

3.2.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills.

3.2.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

3.2.3 PCB Spill Cleanup

40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible, but no later than 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

3.2.4 Records and Certification

Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide test results of cleanup and certification of decontamination.

3.3 REMOVAL

3.3.1 Ballasts

As ballast are removed from the lighting fixture, inspect label on ballast. Ballasts without a "No PCB" label shall be assumed to contain PCBs and containerized and disposed of as required under paragraphs STORAGE FOR DISPOSAL and DISPOSAL. If there are less than 1600 "No PCB" labeled lighting ballasts dispose of them as normal demolition debris.

3.3.2 Lighting Lamps

Remove lighting tubes/lamps from the lighting fixture and carefully place (unbroken) into appropriate containers (original transport boxes or equivalent). In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as universal waste as specified herein.

3.4 STORAGE FOR DISPOSAL

3.4.1 Storage Containers for PCBs

49 CFR 178. Store PCB in containers approved by DOT for PCB.

3.4.2 Storage Containers for lamps

Store mercury containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

3.4.3 Labeling of Waste Containers

Label with the following:

a. Date the item was placed in storage and the name of the cognizant activity/building.

b. "Caution Contains PCB," conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.

c. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.5 DISPOSAL

Dispose of off Government property in accordance with EPA, DOT, and local regulations at a permitted site.

3.5.1 Identification Number

Federal regulations 40 CFR 761, and 40 CFR 263 require that generators, transporters, commercial storers, and disposers of PCB waste posses U.S. EPA identification numbers. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Uniform Hazardous Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work. For mercury containing lamp removal, Federal regulations 40 CFR 273 require that large quantity handlers of Universal waste (LQHUW) must provide notification of universal waste management to the appropriate EPA Region (or state director in authorized states), obtain an EPA

identification number, and retain for three years records of off-site shipments of universal waste. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Universal Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work.

3.5.2 Transporter Certification

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the PCB waste, sign and date the manifest acknowledging acceptance of the PCB waste from the Government. Return a signed copy to the Government before leaving the job site. Ensure that the manifest accompanies the PCB waste at all times. Submit transporter certification of notification to EPA of their PCB waste activities (EPA Form 7710-53).

3.5.2.1 Certificate of Disposal and/or Recycling

40 CFR 761. Certificate for the PCBs and PCB items disposed shall include:

a. The identity of the disposal and or recycling facility, by name, address, and EPA identification number.

b. The identity of the PCB waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.

c. A statement certifying the fact of disposal and or recycling of the identified PCB waste, including the date(s) of disposal, and identifying the disposal process used.

d. A certification as defined in 40 CFR 761.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E119	(2012a) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; E 2013;R 2013) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2007; R 2011) Fire-Resistive Joint Systems
ASTM E2174	(2010a; E 2011) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2010) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
ASTM E699	(2009) Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
ASTM E814	(2013a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	(2013a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2003; Reprint Oct 2012) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2012) Tests for Fire Resistance of Building Joint Systems
UL 723	(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2012) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2.2 Sequencing

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.2.3 Submittals Requirements

a. Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory,

installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

b. Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification of compliance with UL 1479.

c. Submit documentation of training and experience for Installer.

d. Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping Materials; G

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Inspector Qualifications
Firestopping Materials
Installer Qualifications; G

1.4 QUALITY ASSURANCE

1.4.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or

b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer shall have been trained by

a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer written certification of training, and retain proof of certification for duration of firestop installation.

1.4.2 Inspector Qualifications

The inspector shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of two years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment. Firestop material must be free from Ethylene Glycol, PCB, MEK, or other types of hazardous chemicals.

2.1.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.1.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

2.1.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating shall be in accordance with the requirements of ICC IBC.

2.1.3.1.3 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = Rating of wall or partition being penetrated, T Rating = shall be in accordance with the requirements of ICC IBC .

2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SYSTEM DESCRIPTION, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install

firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products.

3.2.2.1 Re-Enterable Devices

Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf at 0 percent to 100 percent visual fill.

3.2.2.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

3.3 INSPECTION

3.3.1 General Requirements

For Navy projects, install one of each type of penetration and have it inspected and accepted by the Naval Facilities Engineering Command Mid-Atlantic, Fire Protection Engineer prior to the installation of the

remainder of the penetrations. At this inspection, the manufacturer's technical representative of the firestopping material shall be present. For all projects, the remainder of the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Contracting Officer. The inspector shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

3.3.2 Inspection Standards

Inspect all firestopping in accordance to ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

-- End of Section --

SECTION 12 93 00

SITE FURNISHINGS
02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2010) Specification for Structural Steel Buildings

ASTM INTERNATIONAL (ASTM)

ASTM B429/B429M	(2010; E 2012) Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shelters
Assembly Instruction Drawings

SD-03 Product Data

Shelters

SD-06 Test Reports

Testing

1.3 QUALITY ASSURANCE

1.3.1 Installation Drawings

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation.

1.3.2 Assembly Instruction Drawings

Submit assembly instruction drawings showing layout(s), connections, bolting and anchoring details in accordance with manufacturer's standards. Submit drawings showing scaled details of proposed site furnishings,

elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

1.4 DELIVERY, STORAGE, AND HANDLING

Ship items knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. Materials shall be delivered, handled, and stored in accordance with the manufacturer's recommendations. Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality. Protect from corrosion, staining, and other types of damage. Store items in designated area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 SHELTERS

AISC 360. Provide prefabricated shelter systems to meet design conditions indicated. Shelter design shall conform to all applicable State and Local Building Codes and shall meet manufacturer's standards of construction and materials. Shelter systems shall be preglazed, pre-drilled and pre-cut, shipped with all hardware and accessories necessary for complete field assembly. Shelter be ADA compliant with open front and measure 8' wide by 4' deep with matching bench.

2.1.1 Framing Systems

Framing system; columns, rafters, ridge, purlins and other structural framing members shall be aluminum as indicated. Manufacturer shall provide shop drawings and calculations prepared by a structural engineer.

2.1.1.1 Aluminum

Extruded aluminum alloy tubing shall conform to ASTM B429/B429M 6063-T5 or 3003-H14, dark bronze finish. Framing sizes and configurations shall be as required for size of structure indicated meeting manufacturer's standards and applicable building codes.

2.1.2 Roof Panels

Provide manufacturer's standard molded acrylic translucent roof panel. Materials shall be factory finished and shipped with all necessary fasteners and accessories as required for complete site assembly.

2.1.3 Glazing

Factory installed in separate structural window frames, gasketed and glazed in accordance with manufacturer's standard, interchangeable, glazing system. Provide 3/16 inch clear tempered glass on three sides of the shelter.

PART 3 EXECUTION

3.1 INSTALLATION

Verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site

furnishings. Site furnishings shall be installed plumb and true, at locations indicated,in accordance with the approved manufacturer's instructions.

3.1.1 Assembly and Erection of Components

New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.1.2 Anchorage, Fastenings, and Connections

Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

3.2 TESTING

Test each site furnishing to ascertain a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: Measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. Submit a written report describing the results of the testing and a report of post-installation test results.

3.3 FINISHES

3.4 SHELTERS

Secure to the adjacent construction with the clip angles attached to the concrete. Secure to concrete with not less than two 1/2 inch diameter expansion bolts.

3.4.1 Glazing

Factory install windows into separate structural frame. Miter corners and connect internally by extruded aluminum corner keys or screw bosses with tamper-proof stainless steel screws. Provide continuous gasketing around windows set to metal frames. Provide 1/2 to 3/4 inch deep pocket for polycarbonate glazing. Fully gasket and frame in independent interchangeable factory assembled units. Affix to shelter frame with 3/16 inch shallow head aluminum rivets at approximately13-1/4 inches on centers for full 360 degrees, rivet from inside of shelter.

3.4.2 Roof

Provide manufacturer's standard roof system including facia assembly, ensuring a weather-tight seal and installation.

3.5 RESTORATION AND CLEAN UP

When the installation has been completed, clean up and protect the site. Existing areas that have been damaged from the installation operation shall be restored to original condition at Contractor's expense.

3.5.1 Clean Up

The site shall be cleaned of all materials associated with the installation. Site furnishing surfaces shall be cleaned of dirt, stains, filings, and other blemishes occurring from shipment and installation. Cleaning methods and agents shall be according to manufacturer's instructions or as indicated.

-- End of Section --

SECTION 21 13 21.00 20

FOAM FIRE EXTINGUISHING FOR FUEL TANK PROTECTION
11/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C500	(2009) Metal-Seated Gate Valves for Water Supply Service

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 11	(2010; TIA 10-1) Standard for Low-, Medium- and High- Expansion Foam
NFPA 13	(2013) Standard for the Installation of Sprinkler Systems
NFPA 14	(2013) Standard for the Installation of Standpipes and Hose Systems
NFPA 16	(2011) Standard for Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
NFPA 24	(2013) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 30	(2012; Errata 2011; Errata 2011) Flammable and Combustible Liquids Code
NFPA 70	(2014) National Electrical Code
NFPA 72	(2013) National Fire Alarm and Signaling Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II
SSPC SP 11	(2012) Power Tool Cleaning to Bare Metal

SSPC SP 3	(1982; E 2004) Power Tool Cleaning

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-58092	(Basic; Notice 1) Tape, Antiseize, Polytetrafluoroethylene

UNDERWRITERS LABORATORIES (UL)

UL 262	(2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

1.2.1 Design Requirements

Design and modify an existing aqueous film forming foam (AFFF) fuel tank protection system for the CEP-11 Tank. System shall provide uniform distribution of AFFF solution to provide complete coverage by surface application to the tank(s) indicated. The design, equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 11, NFPA 13, NFPA 14, NFPA 16, NFPA 24, NFPA 30, NFPA 70, and NFPA 72, except as modified herein. Devices and equipment for fire protection service shall be of a make and type listed by the Underwriter's Laboratories Inc. in the UL Fire Prot Dir, or approved by the Factory Mutual System and listed in FM APP GUIDE. In the publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Mid-Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer. Begin work at the point indicated.

1.2.1.1 Shop Drawings

Prepare shop drawings for the fire extinguishing system in accordance with the requirements for "Plans" as specified in NFPA 11 and "Working Plans" as specified in NFPA 13. Each drawing shall be 34 by 22 inches. Do not commence work until the design of the system and the various components have been approved. Show:

a. Tank and tank farm area layout and include data essential to the proper installation of the system.

b. Foam chambers, discharge nozzles and system piping layout annotated with reference points for design calculations.

1.2.1.2 Calculations

Submit design calculations for the system.

a. Hydraulic calculations showing basis for design in accordance with NFPA 11 and NFPA 13.

b. Pressure discharge graphs or tables showing relationship for foam chambers and discharge nozzles.

c. Contractor is responsible for obtaining information on existing foam chambers while conducting their initial site visit prior to the start of work.

1.2.1.3 As-Built Drawings for the Fire Extinguishing System

Upon completion, and before final acceptance of the work, submit a complete set of as-built drawings of each system. Submit 34 by 22 inch reproducible as-built drawings on mylar film with 8 by 4 inch title block similar to contract drawings. Submit as-built drawings in addition to the record drawings required by Division 1.

1.2.2 System Operation

Flow of water and AFFF shall be controlled by the fire department's trucks.

1.2.2.1 Tank System

Tank AFFF system shall be controlled by the fire department.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The fire protection engineer, Mid-Atlantic Division, Naval Facilities Engineering Command will review any approve all submittals in this section requiring Government approval.

SD-02 Shop Drawings

Fire extinguishing system; G

SD-03 Product Data

Pipe, fittings, and mechanical couplings; G

Valves, including gate, check, and globe; G

Pipe hangers and supports; G

Fire department inlet connections; G

Data which describe more than one type of item shall be clearly marked to indicate which type the Contractor intends to provide. Submit only originals. Photocopies will not be accepted. Partial submittals will not be accepted.

SD-05 Design Data

Hydraulic calculations; G

Pressure discharge graphs or tables; G

SD-06 Test Reports

Preliminary tests; G

Acceptance tests; G

Submit for all inspections and tests specified under paragraph entitled "Field Quality Control."

SD-07 Certificates

Qualifications of installer; G

Submit installers qualifications as required under paragraph entitled "Qualifications of Installer."

SD-10 Operation and Maintenance Data

Instructions for operating the fire extinguishing system, Data Package 4; G

Submit in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. Furnish one complete set of data prior to the time that final acceptance tests are performed, and furnish the remaining sets before the contract is completed.

SD-11 Closeout Submittals

As-built drawings for the fire extinguishing system; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications of Installer

Prior to commencing work, submit data showing that the Contractor has successfully installed automatic foam fire extinguishing systems of the same type and design as specified herein, or that he has a firm contractual agreement with a subcontractor having the required experience. Include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate the type and design of each system, and certify that the system has performed satisfactorily for a period of at least 18 months.

Qualifications of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Special Hazard System program. Contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

PART 2 PRODUCTS

2.1 DESIGN OF FOAM SYSTEMS

Design of fuel tank fire extinguishing foam systems shall be by hydraulic calculations for uniform distribution of AFFF solution over the protected area and shall conform to the NFPA standards listed above and to the requirements as specified herein.

2.1.1 Tankside Foam Chambers

Foam Chambers are existing to remain.

2.1.2 AFFF Solution Distribution

Distribution shall be essentially uniform from all foam chambers on any single tank.

2.1.3 AFFF Solution Application Density

The solution application density shall be determined by the contractor during the initial site visit.

2.1.4 Foam Chamber Discharge Area

Area shall be over the entire liquid surface as required by NFPA 11.

2.1.5 Friction Losses

Calculate losses in pipe in accordance with the Hazen-Williams Formula with 'C' value of 100 for steel pipe, 150 for copper tube, and 140 for cement lined ductile iron pipe.

2.1.6 Location of Foam Chambers

Foam chambers are existing.

2.1.7 Water Supply

The available water supply shall be determined by conducting a flow test of the fire hydrant located nearest to the fire department connections for the AFFF system. The available pressure will be boosted by the fire department. Ensure that the available flow and pressure exist to support the hydraulically calculated demands of the AFFF system.

2.2 ABOVEGROUND PIPING SYSTEMS

2.2.1 Pipe, Fittings, and Mechanical Couplings

NFPA 11, except steel piping shall be Schedule 40 for sizes smaller than 8 inches, and Schedule 30 or 40 for sizes 8 inches and larger. All steel piping shall be zinc-coated. Pipe nipples 6 inches long and shorter shall be Schedule 80 steel pipe. Gasketed fittings are not permitted inside the diked area. Use of restriction orifices, reducing flanges, and plain-end fittings with mechanical couplings (which utilize steel gripping devices to bite into the pipe when pressure is applied) are not permitted. Pipe and fittings in contact with AFFF concentrate shall be stainless steel. Fittings on concentrate lines shall be flanged or welded only. Screwed or mechanical fittings will not be permitted.

2.2.2 Jointing Material

CID A-A-58092, Polytetrafluoroethylene (PTFE) tape. Pipe joint compound (pipe dope) is not acceptable.

2.2.3 Pipe Hangers and Supports

NFPA 11 and NFPA 13.

2.2.4 Valves

Provide valves as required by NFPA 11 and NFPA 13 and of types approved for fire service. Gate valves shall open by counterclockwise rotation. Butterfly valves are not acceptable.

2.2.5 Identification Signs

Attach properly lettered approved metal signs conforming to NFPA 13 to each valve and alarm device. Permanently affix design data nameplates to the riser of each system. Provide a new permanently affixed sign at the fire department connections. This sign shall indicate the required pressure to be provided at these connections for proper system operation. The required pressure shall be determined by the hydraulic calculations.

2.2.6 Drains

Provide a low point drain in order for the system to drain completely after use. A ball drip at the low point is acceptable. Provide drain piping to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. Provide auxiliary drains as required by NFPA 11 and NFPA 13.

2.2.7 Pipe Sleeves

Provide where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 1/4 inch space between exterior of piping and interior of sleeve. Firmly pack space with insulation and caulk at both ends of the sleeve with plastic waterproof cement.

2.2.8 Fire Department Inlet Connections

Provide 4 connections with 2 1/2 inch National Standard male/female hose threads with plug, chain, and identifying fire department connection escutcheon plate. Provide inlet connections about 3 feet above grade where shown on drawings.

2.3 BURIED PIPING SYSTEMS

2.3.1 Pipe and Fittings

NFPA 24, outside coated cement lined ductile iron pipe and fittings for piping under ground. Anchor the joints in accordance with NFPA 24 using pipe clamps and steel rods. Minimum pipe size shall be 6 inches. Minimum depth of cover shall be 3 feet.

2.3.2 Valves

Provide as required by NFPA 24 for fire service. Gate valves shall conform to AWWA C500 or UL 262 with cast iron body and bronze trim, and shall open by counterclockwise rotation.

2.3.3 Buried Utility Warning and Identification Tape

Provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED WATER PIPING BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 3 EXECUTION

3.1 EXCAVATION, BACKFILLING, AND COMPACTING

Provide under this section as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

3.2 AFFF SYSTEM INSTALLATION

Equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with the NFPA standards referenced herein. Install piping straight and true to bear evenly on hangers and supports. Piping shall be inspected, tested and approved before being concealed. Provide fittings for changes in direction of piping and for all connections. Make changes in piping sizes through standard reducing pipe fittings; do not use bushings. Cut pipe accurately and work into place without springing or forcing. Ream pipe ends and free pipe and fittings from burrs. Clean with solvent to remove all varnish and cutting oil prior to assembly. Make screw joints with PTFE tape applied to male thread only.

3.3 FIELD PAINTING

Clean, prime, and paint new foam systems including valves, piping, conduit, hangers, miscellaneous metal work, and accessories. Apply coatings to clean dry surfaces using clean brushes. Clean the surfaces in accordance with SSPC SP 3 SSPC SP 11. Immediately after cleaning, prime the metal surfaces with one coat of SSPC Paint 25 primer applied to a minimum dry film thickness of 1.5 mils. Exercise care to avoid the painting of operating devices. Upon completion of painting, remove materials which were used to protect operating devices while painting is in process. Remove operating devices which have been inadvertently painted and provide new clean operating devices of the proper type. Finish primed surfaces as follows:

3.3.1 Foam Systems in All Other Areas

Paint primed surfaces with two coats of paint to match adjacent surfaces, except paint valves and operating accessories with two coats of CID A-A-2962 white enamel applied to a minimum dry film thickness of 1.5 mils.

3.3.2 Piping Labels

Provide permanent labels in foam rooms, spaced at 20 foot maximum intervals along pipe, indicating "WATER", "FOAM CONCENTRATE", and "FOAM SOLUTION" on

corresponding piping.

3.3.3 Field Touch-Up

Clean damaged areas of shop coated tanks in accordance with SSPC SP 11 and coat cleaned areas with the same materials used for the shop applied coating system.

3.4 FLUSHING

Flush the piping system with potable water in accordance with NFPA 13. Continue flushing operation until water is clear, but for not less than 10 minutes.

3.5 FIELD QUALITY CONTROL

Prior to initial operation, inspect equipment and piping systems for compliance with drawings, specifications, and manufacturer's submittals. Perform tests in the presence of the Contracting Officer to determine conformance with the specified requirements.

3.5.1 Preliminary Tests

Each piping system shall be hydrostatically tested at 200 psig in accordance with NFPA 11 and NFPA 13 and shall show no leakage or reduction in gage pressure after 2 hours. The Contractor shall conduct complete preliminary tests, which shall encompass all aspects of system operation. Individually test all detectors, manual actuation stations, alarms, control panels, and all other components and accessories to demonstrate proper functioning. Test water flow alarms by flowing water. When tests have been completed and all necessary corrections made, submit to the Contracting Officer a signed and dated certificate, similar to that specified in NFPA 13, attesting to the satisfactory completion of all testing and stating that the system is in operating condition. Also include a written request for a formal inspection and test.

3.5.2 Formal Inspection and Tests (Acceptance Tests)

The Mid-Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer, will witness formal tests and approve all systems before they are accepted. The system shall be considered ready for such testing only after all necessary preliminary tests have been made and all deficiencies found have been corrected to the satisfaction of the equipment manufacturer's technical representative and written certification to this effect is received by the Division Fire Protection Engineer. Submit the request for formal inspection at least 15 working days prior to the date the inspection is to take place. The control panel(s) and detection system(s) shall be in continuous service for a "break-in" period of at least 15 consecutive days prior to the formal inspection. Experienced technicians regularly employed by the Contractor in the installation of both the mechanical and electrical portions of such systems shall be present during the inspection and shall conduct the testing. All AFFF concentrate, instruments, personnel, appliances and equipment for testing shall be furnished by the Contractor. All necessary tests encompassing all aspects of system operation shall be made including the following, and any deficiency found shall be corrected and the system retested at no cost to the Government.

3.5.2.1 Systems and Device Testing

The entire initiating, alarm, actuation systems shall be operated. As a minimum, operation and supervision of the following functions and devices shall be demonstrated:

a. All operational and supervisory functions of the control and annunciator panels.

b. Each manual actuation station and associated circuit(s).

c. All detectors and associated circuits.

d. All alarms and associated circuits.

e. All actuator circuits and system control valve(s) (without foam discharge).

f. Activation of the fire alarm system.

g. Activation of the Base fire alarm system (receipt of fire alarm at alarm office).

h. All of the above tests shall then be repeated with the system on battery power only.

3.5.2.2 Flushing and Rinsing

After completion of tests flush all piping carrying AFFF concentrate and solution with fresh water. Piping normally containing AFFF concentrate when the system is in standby mode need not be flushed. Rinse with fresh water all equipment and surfaces exposed to AFFF discharge.

3.5.3 Additional Tests

When deficiencies, defects or malfunctions develop during the tests required, all further testing of the system shall be suspended until proper adjustments, corrections or revisions have been made to assure proper performance of the system. If these revisions require more than a nominal delay, the Contracting Officer shall be notified when the additional work has been completed, to arrange a new inspection and test of the system. All tests required shall be repeated prior to final acceptance, unless directed otherwise.

3.5.4 Manufacturer's Representative

Provide the services of representatives or technicians from the manufacturers of the foam system and control panel, experienced in the installation and operation of the type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of the system and to provide instruction to Government personnel.

3.6 OPERATING INSTRUCTIONS

Provide operating instructions at control equipment and at each remote control station. Instructions shall clearly indicate all necessary steps for the operation of the system. Submit the proposed legend for operating instructions for approval prior to installation. Instructions shall be in engraved white letters on red rigid plastic or red enameled steel

backgrounds and shall be of adequate size to permit them to be easily read.

3.7 TRAINING REQUIREMENTS

Prior to final acceptance, the Contractor shall provide two sessions of 4 hours each of operation and maintenance training to the Base Fire Department and Public Works personnel on two different days to accommodate both shifts of the Base Fire Department. Each training session shall include emergency procedures, and unique maintenance and safety requirements. Training areas will be provided by the Government. The training conducted shall use operation and maintenance manuals specified in paragraph entitled "Operations and Maintenance Manuals." Dates and times of the training period shall be coordinated through the Contracting Officer not less than two weeks prior to the session.

-- End of Section --

SECTION 26 00 00.00 20

BASIC ELECTRICAL MATERIALS AND METHODS
07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-6 2013) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to certain sections of Division 02, EXISTING CONDITIONS and to applies to all sections of Division 26 and 33, ELECTRICAL and UTILITIES, of this project specification unless specified otherwise in the individual sections. This section has been incorporated into, and thus, does not apply to, and is not referenced in the following sections.

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM
Section 26 56 00 EXTERIOR LIGHTING
Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION

1.3 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 11.5 kV primary, three phase, three wire, 60 Hz, and 208Y/120 volts secondary, three phase, four wire. Final connections to the power distribution system at the existing overhead distribution line shall be made by the Contractor as directed by the Contracting Officer.

1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

1.5.1 Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the

products of the same manufacturer unless stated in the technical section.

1.6.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.9 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.10 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.11 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

PART 2 PRODUCTS

2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements specified in the technical sections.

PART 3 EXECUTION

3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

-- End of Section --

SECTION 26 08 00

APPARATUS INSPECTION AND TESTING
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2013) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to this section with additions and modifications specified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Acceptance tests and inspections; G

SD-07 Certificates

Qualifications of organization, and lead engineering technician; G

Acceptance test and inspections procedure; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

Contractor shall engage the services of a qualified testing organization to provide inspection, testing, calibration, and adjustment of the electrical distribution system and generation equipment listed in paragraph entitled "Acceptance Tests and Inspections" herein. Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor. No work required by this section of the specification shall be performed by a second tier subcontractor.

a. Submit name and qualifications of organization. Organization shall have been regularly engaged in the testing of electrical materials, devices, installations, and systems for a minimum of 5 years. The organization shall have a calibration program, and test instruments

used shall be calibrated in accordance with NETA ATS.

b. Submit name and qualifications of the lead engineering technician performing the required testing services. Include a list of three comparable jobs performed by the technician with specific names and telephone numbers for reference. Testing, inspection, calibration, and adjustments shall be performed by an engineering technician, certified by NETA or the National Institute for Certification in Engineering Technologies (NICET) with a minimum of 5 years' experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

1.4.2 Acceptance Tests and Inspections Reports

Submit certified copies of inspection reports and test reports. Reports shall include certification of compliance with specified requirements, identify deficiencies, and recommend corrective action when appropriate. Type and neatly bind test reports to form a part of the final record. Submit test reports documenting the results of each test not more than 10 days after test is completed.

1.4.3 Acceptance Test and Inspections Procedure

Submit test procedure reports for each item of equipment to be field tested at least 45 days prior to planned testing date. Do not perform testing until after test procedure has been approved.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 ACCEPTANCE TESTS AND INSPECTIONS

Testing organization shall perform acceptance tests and inspections. Test methods, procedures, and test values shall be performed and evaluated in accordance with NETA ATS, the manufacturer's recommendations, and paragraph entitled "Field Quality Control" of each applicable specification section. Tests identified as optional in NETA ATS are not required unless otherwise specified. Equipment shall be placed in service only after completion of required tests and evaluation of the test results have been completed. Contractor shall supply to the testing organization complete sets of shop drawings, settings of adjustable devices, and other information necessary for an accurate test and inspection of the system prior to the performance of any final testing. Contracting Officer shall be notified at least 14 days in advance of when tests will be conducted by the testing organization. Perform acceptance tests and inspections on applicable equipment and systems specified in the following sections:

a. Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION

b. Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION

3.2 SYSTEM ACCEPTANCE

Final acceptance of the system is contingent upon satisfactory completion

of acceptance tests and inspections.

3.3 PLACING EQUIPMENT IN SERVICE

A representative of the approved testing organization shall be present when equipment tested by the organization is initially energized and placed in service.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM
02/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B1	(2013) Standard Specification for Hard-Drawn Copper Wire
ASTM B8	(2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2005) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2005) American National Standard for Electrical Metallic Tubing (EMT)
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2010) Terminal Blocks
NEMA ICS 6	(1993; R 2011) Enclosures

NEMA MG 1	(2011; Errata 2012) Motors and Generators
NEMA MG 10	(2013) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors
NEMA WD 1	(1999; R 2005; R 2010) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2012) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)

UNDERWRITERS LABORATORIES (UL)

UL 1063	(2006; Reprint Jul 2012) Machine-Tool Wires and Cables
UL 44	(2014) Thermoset-Insulated Wires and Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2013; Reprint Feb 2014) Wire Connectors
UL 486C	(2013; Reprint Feb 2014) Splicing Wire Connectors
UL 489	(2013; Reprint Mar 2014) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(2012; Reprint Feb 2014) Attachment Plugs and Receptacles
UL 50	(2007; Reprint Apr 2012) Enclosures for Electrical Equipment, Non-environmental Considerations
UL 506	(2008; Reprint Oct 2013) Specialty Transformers
UL 508	(1999; Reprint Oct 2013) Industrial Control Equipment

UL 510	(2005; Reprint Jul 2013) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	(2013) Metallic Outlet Boxes
UL 514B	(2012) Conduit, Tubing and Cable Fittings
UL 514C	(2014) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel
UL 797	(2007; Reprint Dec 2012) Electrical Metallic Tubing -- Steel
UL 83	(2014) Thermoplastic-Insulated Wires and Cables
UL 984	(1996; Reprint Sep 2005) Hermetic Refrigerant Motor-Compressors

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Marking strips drawings; G

SD-03 Product Data

Receptacles; G

Circuit breakers; G

Motor controllers; G

SD-06 Test Reports

600-volt wiring test; G

Grounding system test; G

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory

provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable.

1.5 WARRANTY

Provide equipment items supported by service organizations that are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

As a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

2.2 CONDUIT AND FITTINGS

Conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6.

2.2.2 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, ANSI C80.3.

2.2.3 Fittings for Metal Conduit, and EMT

UL 514B. Ferrous fittings: cadmium- or zinc-coated in accordance with UL 514B.

2.2.3.1 Fittings for Rigid Metal Conduit

Threaded-type. Split couplings unacceptable.

2.2.3.2 Fittings for EMT

Die Cast compression type.

2.3 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.4 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.5 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Do not use wires and cables manufactured more than 12 months prior to date of delivery to site.

2.5.1 Conductors

Provide the following:

a. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.

b. Conductors No. 8 AWG and larger diameter: stranded.

c. Conductors No. 10 AWG and smaller diameter: solid.

d. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3: stranded unless specifically indicated otherwise.

e. All conductors: copper.2.5.1.1 Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

a. Branch circuits: No. 12 AWG.

b. Class 1 remote-control and signal circuits: No. 14 AWG.

c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.

d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.

2.5.2 Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

2.5.2.1 Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

a. Grounding conductors: Green.

b. Neutral conductors: White.

c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals color coding: white with a different colored (not green) stripe for each.

2.5.2.2 Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

a. 208/120 volt, three-phase

(1) Phase A - black

(2) Phase B - red

(3) Phase C - blue

b. 120/240 volt, single phase: Black and red

2.5.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, provide power wires rated for 600-volts, Type THWN/THHN conforming to UL 83, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits: Type TW or TF, conforming to UL 83.

2.5.4 Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.6 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires: insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.7 DEVICE PLATES

Provide the following:

a. UL listed, one-piece device plates for outlets to suit the devices installed.

b. For metal outlet boxes, plates on unfinished walls: zinc-coated sheet steel or cast metal having round or beveled edges.

c. For nonmetallic boxes and fittings, other suitable plates may be provided.

d. Plates on finished walls: satin finish stainless steel or brushed-finish aluminum, minimum 0.03 inch thick.

e. Screws: machine-type with countersunk heads in color to match finish of plate.

f. Sectional type device plates are not be permitted.

g. Plates installed in wet locations: gasketed and UL listed for "wet locations."

2.8 RECEPTACLES

Provide the following:

a. UL 498, hard use (also designated heavy-duty), grounding-type.

b. Ratings and configurations: as indicated.

c. Bodies: white as per NEMA WD 1.

d. Face and body: thermoplastic supported on a metal mounting strap.

e. Dimensional requirements: per NEMA WD 6.

f. Screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.

g. Grounding pole connected to mounting strap.

h. The receptacle: containing triple-wipe power contacts and double or triple-wipe ground contacts.

2.9 PANELBOARDS

2.9.1 Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals: UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.9.1.1 Multipole Breakers

Provide common trip-type with single operating handle. Design breaker such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.10 MOTORS

Provide motors in accordance with the following:

a. NEMA MG 1.

b. Hermetic-type sealed motor compressors: Also comply with UL 984.

c. Provide the size in terms of HP, or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified.

d. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters.

e. Rate motors for operation on 208-volt, 3-phase circuits with a terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits with a terminal voltage rating of 460 volts.

f. Use motors designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.

g. Unless otherwise indicated, use continuous duty type motors if rated 1 HP and above.

h. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.

2.10.1 High Efficiency Single-Phase Motors

Single-phase fractional-horsepower alternating-current motors: high efficiency types corresponding to the applications listed in NEMA MG 11. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

2.10.2 Premium Efficiency Polyphase Motors

Select polyphase motors based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10. In addition, continuous rated, polyphase squirrel-cage medium induction motors must meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

2.10.3 Motor Sizes

Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified

capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

2.10.4 Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment as specified herein. Power wiring and conduit: conform to the requirements specified herein. Control wiring: provided under, and conform to, the requirements of the section specifying the associated equipment.

2.11 MOTOR CONTROLLERS

Provide motor controllers in accordance with the following:

a. UL 508, NEMA ICS 1, and NEMA ICS 2.

b. Provide controllers with thermal overload protection in each phase, and one spare normally open auxiliary contact, and one spare normally closed auxiliary contact.

c. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.

d. Provide protection for motors from immediate restart by a time adjustable restart relay.

e. When used with pressure, float, or similar automatic-type or maintained-contact switch, provide a hand/off/automatic selector switch with the controller.

f. Connections to selector switch: wired such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position.

g. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices: connected in motor control circuit in "hand" and "automatic" positions.

h. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device: made in accordance with indicated or manufacturer's approved wiring diagram.

i. Provide selector switch with the means for locking in any position.

j. Provide a disconnecting means, capable of being locked in the open position, for the motor that is located in sight from the motor location and the driven machinery location. As an alternative, provide a motor controller disconnect, capable of being locked in the open position, to serve as the disconnecting means for the motor if it is in sight from the motor location and the driven machinery location.

l. Overload protective devices: provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case.

m. Cover of combination motor controller and manual switch or circuit breaker: interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position.

2.11.1 Control Wiring

Provide control wiring in accordance with the following:

a. All control wire: stranded tinned copper switchboard wire with 600-volt flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and passing the VW-1 flame tests included in those standards.

b. Hinge wire: Class K stranding.

c. Current transformer secondary leads: not smaller than No. 10 AWG.

d. Control wire minimum size: No. 14 AWG.

e. Power wiring for 480-volt circuits and below: the same type as control wiring with No. 12 AWG minimum size.

f. Provide wiring and terminal arrangement on the terminal blocks to permit the individual conductors of each external cable to be terminated on adjacent terminal points.

2.11.2 Control Circuit Terminal Blocks

Provide control circuit terminal blocks in accordance with the following:

a. NEMA ICS 4.

b. Control circuit terminal blocks for control wiring: molded or fabricated type with barriers, rated not less than 600 volts.

c. Provide terminals with removable binding, fillister or washer head screw type, or of the stud type with contact and locking nuts.

d. Terminals: not less than No. 10 in size with sufficient length and space for connecting at least two indented terminals for 10 AWG conductors to each terminal.

e. Terminal arrangement: subject to the approval of the Contracting Officer with not less than four (4) spare terminals or 10 percent, whichever is greater, provided on each block or group of blocks.

f. Modular, pull apart, terminal blocks are acceptable provided they are of the channel or rail-mounted type.

g. Submit data showing that any proposed alternate will accommodate the specified number of wires, are of adequate current-carrying capacity, and are constructed to assure positive contact between current-carrying parts.

2.11.2.1 Types of Terminal Blocks

a. Short-Circuiting Type: Short-circuiting type terminal blocks: furnished for all current transformer secondary leads with provision for shorting together all leads from each current transformer without first opening any circuit. Terminal blocks: comply with the requirements of paragraph CONTROL CIRCUIT TERMINAL BLOCKS above.

b. Load Type: Load terminal blocks rated not less than 600 volts and of adequate capacity: provided for the conductors for NEMA Size 3 and smaller motor controllers and for other power circuits, except those for feeder tap units. Provide terminals of either the stud type with contact nuts and locking nuts or of the removable screw type, having length and space for at least two indented terminals of the size required on the conductors to be terminated. For conductors rated more than 50 amperes, provide screws with hexagonal heads. Conducting parts between connected terminals must have adequate contact surface and cross-section to operate without overheating. Provide eEach connected terminal with the circuit designation or wire number placed on or near the terminal in permanent contrasting color.

2.11.3 Control Circuits

Control circuits: maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers: conform to UL 506, as applicable. Transformers, other than transformers in bridge circuits: provide primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. Provide for automatic switchover and alarm upon failure of primary control circuit.

2.11.4 Enclosures for Motor Controllers

NEMA ICS 6.

2.12 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Comply with requirements of Division 23, "Mechanical" for mechanical isolation of machines and other equipment.

2.13 GROUNDING AND BONDING EQUIPMENT

2.13.1 Ground Rods

UL 467. Ground rods: copper-clad steel, with minimum diameter of 3/4 inch and minimum length 10 feet. Sectional ground rods are permitted.

2.14 MANUFACTURER'S NAMEPLATE

Provide on each item of equipment a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.15 FIELD FABRICATED NAMEPLATES

Provide field fabricated nameplates in accordance with the following:

a. ASTM D709.

b. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.

c. Each nameplate inscription: identify the function and, when applicable, the position.

d. Nameplates: melamine plastic, 0.125 inch thick, white with black center core.

f. Surface: matte finish. Corners: square. Accurately align lettering and engrave into the core.

g. Minimum size of nameplates: one by 2.5 inches.

h. Lettering size and style: a minimum of 0.25 inch high normal block style.

2.16 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00, FIRESTOPPING .

2.17 FACTORY APPLIED FINISH

Provide factory-applied finish on electrical equipment in accordance with the following:

a. NEMA 250 corrosion-resistance test and the additional requirements as specified herein.

b. Interior and exterior steel surfaces of equipment enclosures: thoroughly cleaned followed by a rust-inhibitive phosphatizing or equivalent treatment prior to painting.

c. Exterior surfaces: free from holes, seams, dents, weld marks, loose scale or other imperfections.

d. Interior surfaces: receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice.

e. Exterior surfaces: primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish.

f. Equipment located indoors: ANSI Light Gray, and equipment located outdoors: ANSI Dark Gray.

g. Provide manufacturer's coatings for touch-up work and as specified in paragraph FIELD APPLIED PAINTING.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces: conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

3.1.1 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor: separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size: 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings: made with metal conduit in fire-rated shafts, with metal conduit extending through shafts for minimum distance of 6 inches. Firestop conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors in accordance with Section 07 84 00, FIRESTOPPING.

3.1.1.1 Pull Wire

Install pull wires in empty conduits. Pull wire: plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.2 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.2.1 Restrictions Applicable to EMT

a. Do not install underground.

b. Do not encase in concrete, mortar, grout, or other cementitious materials.

c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.

d. Do not use in hazardous areas.

e. Do not use outdoors.

f. Do not use in fire pump rooms.

g. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.2.2 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.2.3 Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Do not exceed one-fourth proof test load for load applied to fasteners. Provide vibration resistant and shock-resistant fasteners attached to concrete ceiling. Do not cut main reinforcing bars for any holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems: supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installationwith above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations.Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.2.4 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.2.5 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Provide locknuts with sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.2.6 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size: 1/2 inch diameter. Provide liquidtight flexible conduit in

wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.3 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways: cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, and when specifically indicated. Boxes in other locations: sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. Provide each box with volume required by NFPA 70 for number of conductors enclosed in box. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lockwashers and nuts or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.3.1 Boxes

Boxes for use with raceway systems: minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved.

3.1.3.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.4 Mounting Heights

Mount motor controller so height of operating handle at its highest position is maximum 78 inches above floor. Mount other devices as indicated.

3.1.5 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, provide color coding by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, provide color coding by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves.

3.1.5.1 Marking Strips

Provide marking strips in accordance with the following:

a. Provide white or other light-colored plastic marking strips, fastened by screws to each terminal block, for wire designations.

b. Use permanent ink for the wire numbers

c. Provide reversible marking strips to permit marking both sides, or provide two marking strips with each block.

d. Size marking strips to accommodate the two sets of wire numbers.

e. Assign a device designation in accordance with NEMA ICS 1 to each device to which a connection is made. Mark each device terminal to which a connection is made with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams.

f. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, provide additional wire and cable designations for identification of remote (external) circuits for the Government's wire designations.

g. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.

3.1.6 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.7 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.8 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00 FIRESTOPPING.

3.1.9 Grounding and Bonding

Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and neutral conductor of wiring systems.

3.1.9.1 Ground Rods

Provide cone pointed ground rods. Measure the resistance to ground using

the fall-of-potential method described in IEEE 81. Do not exceed 25 ohms under normally dry conditions for the maximum resistance of a driven ground. If this resistance cannot be obtained with a single rod, additional rods, spaced on center, not less than twice the distance of the length of the rod.

3.1.9.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Provide tools and dies as recommended by the manufacturer. Use an embossing die code or other standard method to provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.9.3 Resistance

Maximum resistance-to-ground of grounding system: do not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.10 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications and are provided under the section specifying the associated equipment.

3.1.11 Repair of Existing Work

Perform repair of existing work as follows:

3.1.11.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

3.1.11.2 Existing Concealed Wiring to be Removed

Disconnect existing concealed wiring to be removed from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3.1.11.3 Continuation of Service

Maintain continuity of existing circuits of equipment to remain. Maintain existing circuits of equipment energized. Restore circuits wiring and

power which are to remain but were disturbed during demolition back to original condition.

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.4 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each tests.

3.4.1 Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

3.4.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance: 250,000 ohms.

3.4.3 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 26 56 00

EXTERIOR LIGHTING
05/13

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO LTS	(2013; Errata 2013) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013l INT 1 2013; Errata 1-3 2013; Errata 4 2014) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B108/B108M	(2012; E 2012) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IES)

IES HB-10	(2011) IES Lighting Handbook
IES LM-79	(2008) Electrical and Photometric Measurements of Solid-State Lighting Products
IES LM-80	(2008) Measuring Lumen Maintenance of LED Light Sources
IES RP-16	(2010; Addendum A 2008; Addenda B & C 2009) Nomenclature and Definitions for Illuminating Engineering
IES RP-8	(2000; Errata 2004; R 2005; Errata 2007) Roadway Lighting

IES TM-15	(2011) Luminaire Classification System for Outdoor Luminaires
IES TM-21	(2011) Projecting Long Term Lumen Maintenance of LED Light Sources

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013) National Electrical Safety Code
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C136.13	(2004; R 2009) American National Standard for Roadway Lighting Equipment, Metal Brackets for Wood Poles
ANSI C136.21	(2004; R 2009) American National Standard for Roadway and Area Lighting Equipment - Vertical Tenons Used with Post-Top-Mounted Luminaires
ANSI C136.3	(2005; R 2009) American National Standard for Roadway and Area Lighting Equipment Luminaire Attachments
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ANSLG C78.377	(2011) American National Standard for Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products
NEMA C136.10	(2010) American National Standard for Roadway and Area Lighting Equipment-Locking-Type Photocontrol Devices and Mating Receptacles--Physical and Electrical Interchangeability and Testing
NEMA C136.31	(2010) American National for Roadway and Area Lighting Equipment - Luminaire Vibration
NEMA C82.77	(2002) Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
NEMA IEC 60529	(2004) Degrees of Protection Provided by Enclosures (IP Code)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 1310	(2011; Reprint Oct 2013) UL Standard for Safety Class 2 Power Units
UL 1598	(2008; Reprint Oct 2012) Luminaires
UL 773	(1995; Reprint Mar 2002) Standard for Plug-In, Locking Type Photocontrols for Use with Area Lighting
UL 773A	(2006; Reprint Nov 2013) Standard for Nonindustrial Photoelectric Switches for Lighting Control
UL 8750	(2009; Reprint May 2014) UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products

1.2 RELATED REQUIREMENTS

Materials not considered to be luminaires or lighting equipment are specified in Section(s) 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION and 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION.

1.3 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings shall be as defined in IEEE 100 and IES RP-16.

b. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IES LM-80.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Photometric Plan; G

LED Luminaire Warranty; G

SD-02 Shop Drawings

Luminaire drawings; G

Poles; G

SD-03 Product Data

LED Luminaires; G

Luminaire Light Sources; G

Luminaire Power Supply Units (Drivers); G

Photocell; G

Aluminum poles; G

Brackets

SD-05 Design Data

Design Data for luminaires; G

SD-06 Test Reports

LED Luminaire - IES LM-79 Test Report; G

LED Light Source - IES LM-80 Test Report; G

Operating test

Submit operating test results as stated in paragraph entitled "Field Quality Control."

SD-07 Certificates

Luminaire Useful Life Certificate; G

Submit certification from the manufacturer indicating the expected useful life of the luminaires provided. The useful life shall be directly correlated from the IES LM-80 test data using procedures outlined in IES TM-21. Thermal properties of the specific luminaire and local ambient operating temperature and conditions shall be taken into consideration.

SD-10 Operation and Maintenance Data

Operational Service

Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

1.5 QUALITY ASSURANCE

1.5.1 Drawing Requirements

1.5.1.1 Luminaire Drawings

Include dimensions, effective projected area (EPA), accessories, and installation and construction details. Photometric data, including zonal lumen data, average and minimum ratio, aiming diagram, and computerized candlepower distribution data shall accompany shop drawings.

1.5.1.2 Poles

Include dimensions, wind load determined in accordance with AASHTO LTS, pole deflection, pole class, and other applicable information.

1.5.2 Photometric Plan

For LED luminaires, include computer-generated photometric analysis of the "designed to" values for the "end of useful life" of the luminaire installation using a light loss factor of 0.7. For LED and all other types of luminaires, the submittal shall include the following:

Horizontal illuminance measurements at finished grade, taken at a maximum of every 10 feet.

Vertical illuminance measurements at 5 feet above finished grade.

Minimum and maximum footcandle levels.

Average maintained footcandle level.

Maximum to minimum ratio for horizontal illuminance only.

1.5.3 Design Data for Luminaires

a. Provide distribution data according to IES classification type as defined in IES HB-10.

b. Shielding as defined by IES RP-8 or B.U.G. rating for the installed position as defined by IES TM-15.

c. Provide safety certification and file number for the luminaire family. Include listing, labeling and identification per NFPA 70 (NEC). Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratories).

d. Provide long term lumen maintenance projections for each LED luminaire in accordance with IES TM-21. Data used for projections shall be obtained from testing in accordance with IES LM-80.

e. Provide wind loading calculations for luminaires mounted on poles. Weight and effective projected area (EPA) of luminaires and mounting brackets shall not exceed maximum rating of pole as installed in particular wind zone area.

1.5.4 LED Luminaire - IES LM-79 Test Report

Submit test report on manufacturer's standard production model luminaire. Submittal shall include all photometric and electrical measurements, as well as all other pertinent data outlined under "14.0 Test Report" in IES LM-79.

1.5.5 LED Light Source - IES LM-80 Test Report

Submit report on manufacturer's standard production LED package, array, or module. Submittal shall include:

a. Testing agency, report number, date, type of equipment, and LED light source being tested.

b. All data required by IES LM-80.

1.5.5.1 Test Laboratories

Test laboratories for the IES LM-79 and IES LM-80 test reports shall be one of the following:

a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program.

b. One of the qualified labs listed on the Department of Energy - Energy Efficiency & Renewable Energy, Solid-State Lighting web site.

c. A manufacturer's in-house lab that meets the following criteria:

    1. Manufacturer has been regularly engaged in the design and production of high intensity discharge roadway and area luminaires and the manufacturer's lab has been successfully certifying these fixtures for a minimum of 15 years.

    2. Annual equipment calibration including photometer calibration in accordance with National Institute of Standards and Technology.

1.5.6 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.5.7 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or

brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.7.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if the manufacturer has been regularly engaged in the design and production of high intensity discharge roadway and area luminaires for a minimum of 15 years. Products shall have been in satisfactory commercial or industrial use for 15 years prior to bid opening. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 15-year period.

1.5.7.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

1.6.1 Aluminum Poles

Do not store poles on ground. Support poles so they are at least one foot above ground level and growing vegetation. Do not remove factory-applied pole wrappings until just before installing pole.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.7.1 LED Luminaire Warranty

Provide Luminaire Useful Life Certificate.

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

a. Provide a written five year on-site replacement warranty for material, fixture finish, and workmanship. On-site replacement includes transportation, removal, and installation of new products.

    1. Finish warranty shall include warranty against failure and against substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

    2. Material warranty shall include:

        (a) All power supply units (drivers).

        (b) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

b. Warranty period must begin on date of beneficial occupancy. Contractor shall provide the Contracting Officer signed warranty certificates prior to final payment.

1.8 OPERATIONAL SERVICE

Coordinate with manufacturer for maintenance agreement. Collect information from the manufacturer about maintenance agreement options, and submit to Contracting Officer. Services shall reclaim materials for recycling and/or reuse. Services shall not deposit materials in landfills or burn reclaimed materials. Indicate procedures for compliance with regulations governing disposal of mercury. When such a service is not available, local recyclers shall be sought after to reclaim the materials.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Products and materials not considered to be luminaires, equipment or accessories are specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION, Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION, and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.2 LED LUMINAIRES

UL 1598, NEMA C82.77 and UL 8750. Provide luminaires as indicated in luminaire schedule and XL plates or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. All luminaires of the same type shall be provided by the same manufacturer.

2.2.1 General Requirements

a. LED luminaire housings shall be die cast or extruded aluminum.

b. LED luminaires shall be rated for operation within an ambient temperature range of minus 22 degrees F to 104 degrees F.

c. Luminaires shall be UL listed for wet locations per UL 1598. Optical compartment for LED luminaires shall be sealed and rated a minimum of IP65 per NEMA IEC 60529.

d. LED luminaires shall produce a minimum efficacy as shown in the following table, tested per IES LM-79. Theoretical models of initial raw LED lumens per watt are not acceptable.

Application	Luminaire Efficacy in Lumens per Watt

Exterior Pole/Arm-Mounted Area and Roadway Luminaires	60

e. Luminaires shall have IES distribution and NEMA field angle classifications as indicated in luminaire schedule on project plans per IES HB-10.

f. Housing finish shall be baked-on enamel, anodized, or baked-on powder coat paint. Finish shall be capable of surviving ASTM B117 salt fog environment testing for 2500 hours minimum without blistering or peeling.

g. Luminaires shall not exceed the following IES TM-15 Backlight, Uplight and Glare (B.U.G.) ratings:

1. Maximum Backlight (B) rating shall be determined by lighting zone in which luminaire is placed.

2. Maximum Uplight (U) rating shall be U0.

3. Maximum Glare (G) rating shall be determined by lighting zone in which luminaire is placed.

h. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.

i. The finish color shall be as indicated in the luminaire schedule or detail on the project plans.

j. Luminaire arm bolts shall be 304 stainless steel or zinc-plated steel.

k. Luminaire lenses shall be constructed of clear tempered glass or UV-resistant acrylic.

l. The wiring compartment on pole-mounted, street and area luminaires must be accessible without the use of hand tools to manipulate small screws, bolts, or hardware.

m. Incorporate modular electrical connections, and construct luminaires to allow replacement of all or any part of the optics, heat sinks, power supply units, ballasts, surge suppressors and other electrical components using only a simple tool, such as a manual or cordless electric screwdriver.

n. Luminaires shall have a nameplate bearing the manufacturer's name, address, model number, date of manufacture, and serial number securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

o. Roadway and area luminaires shall have an integral tilt adjustment of plus or minus 5 degrees to allow the unit to be leveled in accordance with ANSI C136.3.

p. Luminaire must pass 3G vibration testing in accordance with NEMA C136.31.

q. All factory electrical connections shall be made using crimp, locking, or latching style connectors. Twist-style wire nuts are not acceptable.

2.2.2 Luminaire Light Sources

2.2.2.1 LED Light Sources

a. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377:

Nominal CCT: 4000 degrees K: 3985 plus or minus 275 degrees K

b. Color Rendering Index (CRI) shall be:

Greater than or equal to 70 for 4000 degrees K light sources.

c. Color Consistency:

Manufacturer shall utilize a maximum 4-step MacAdam ellipse binning tolerance for color consistency of LEDs used in luminaires.

2.2.3 Luminaire Power Supply Units (Drivers)

2.2.3.1 LED Power Supply Units (Drivers)

UL 1310. LED Power Supply Units (Drivers) shall meet the following requirements:

a. Minimum efficiency shall be 85 percent.

b. Drive current to each individual LED shall not exceed 600 mA, plus or minus 10 percent.

c. Shall be rated to operate between ambient temperatures of minus 22 degrees F and 104 degrees F.

d. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120 V to 480 V nominal.

e. Operating frequency shall be: 50 or 60 Hz.

f. Power Factor (PF) shall be greater than or equal to 0.90.

g. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.

h. Shall meet requirements of 47 CFR 15, Class B.

i. Shall be RoHS-compliant.

j. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.

k. Power supplies in luminaires mounted under a covered structure, such as a canopy, or where otherwise appropriate shall be UL listed with a sound rating of A.

1. Shall be equipped with over-temperature protection circuit that turns light source off until normal operating temperature is achieved.

2.2.4 LED Luminaire Surge Protection

Provide surge protection integral to luminaire to meet C Low waveforms as defined by IEEE C62.41.2, Scenario 1, Location Category C.

2.3 EXTERIOR LUMINAIRE CONTROLS

Controls shall comply with Section 9 of ASHRAE 90.1 - IP . Provide a control system interface within each luminaire that is compatible with the energy management or control system used by the utility department in charge of the project area for control of site lighting.

2.3.1 Photocell

UL 773 or UL 773A. Photocells shall be hermetically sealed, silicon diode light sensor type, rated at 90 watts, 120 volts, 50/60 Hz with single-pole, single-throw contacts. Photocell shall be designed to fail to the ON position. Housing shall be constructed of polycarbonate, rated to operate within a temperature range of minus 40 to 158 degrees F. Photocell shall be twist-lock receptacle type conforming to NEMA C136.10. Provide with solid brass prongs and voltage markings and color coding on exterior of housing. Photocell shall turn on at 1-3 footcandles and turn off at 3 to 15 footcandles. A time delay shall prevent accidental switching from transient light sources.

2.4 POLES

Provide poles designed for wind loading of 100 miles per hour determined in accordance with AASHTO LTS while supporting luminaires and all other appurtenances indicated. The effective projected areas of luminaires and appurtenances used in calculations shall be specific for the actual products provided on each pole. Poles shall be anchor-base type designed for use with underground supply conductors. Poles shall have oval-shaped handhole having a minimum clear opening of 2.5 by 5 inches. Handhole cover shall be secured by stainless steel captive screws. Metal poles shall have an internal grounding connection accessible from the handhole near the bottom of each pole. Scratched, stained, chipped, or dented poles shall not be installed.

2.4.1 Aluminum Poles

Provide aluminum poles manufactured of corrosion resistant aluminum alloys conforming to AASHTO LTS for Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys and Alloy 356-T4 (3,5) for cast alloys. Poles shall be seamless extruded or spun seamless type with minimum 0.188 inch wall thickness. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Tops of shafts shall be fitted with a round or tapered cover. Base shall be anchor bolt mounted, made of cast 356-T6 aluminum alloy in accordance with ASTM B108/B108M and shall be machined to receive the lower end of shaft. Joint between shaft and base shall be welded. Base cover shall be cast 356-T6 aluminum alloy in accordance with ASTM B108/B108M. Hardware, except anchor bolts, shall be either 2024-T4 anodized aluminum alloy or stainless steel. Manufacturer's standard provision shall be made for protecting the finish during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small

parts in boxes.

2.5 BRACKETS AND SUPPORTS

ANSI C136.3, ANSI C136.13, and ANSI C136.21, as applicable. Pole brackets shall be not less than 1 1/4 inch aluminum secured to pole. Slip-fitter or pipe-threaded brackets may be used, but brackets shall be coordinated to luminaires provided, and brackets for use with one type of luminaire shall be identical. Brackets for pole-mounted street lights shall correctly position luminaire no lower than mounting height indicated. Mount brackets not less than 24 feet above street. Special mountings or brackets shall be as indicated and shall be of metal which will not promote galvanic reaction with luminaire head.

2.6 POLE FOUNDATIONS

Anchor bolts shall be steel rod having a minimum yield strength of 50,000 psi; the top 12 inches of the rod shall be galvanized in accordance with ASTM A153/A153M. Concrete shall be as specified in Section 32 16 13 CONCRETE SIDEWALKS AND CURBS AND GUTTERS.

2.7 EQUIPMENT IDENTIFICATION

2.7.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.7.2 Labels

Provide labeled luminaires in accordance with UL 1598 requirements. Luminaires shall be clearly marked for operation of specific light sources and ballasts according to proper light source type. The following light source characteristics shall be noted in the format "Use Only _____":

a. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

Markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place.

2.8 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

3.1.1 Aluminum Poles

Provide pole foundations with galvanized steel anchor bolts, threaded at the top end and bent 90 degrees at the bottom end. Provide ornamental covers to match pole and galvanized nuts and washers for anchor bolts. Concrete for anchor bases, polyvinyl chloride (PVC) conduit ells, and ground rods shall be as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit ell. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location. After installation, paint exposed surfaces of steel poles with two finish coats of aluminum paint. Install according to pole manufacturer's instructions. Alterations to poles after fabrication will void manufacturer's warranty and shall not be allowed.

3.1.2 Pole Setting

Depth shall be as indicated. Poles in straight runs shall be in a straight line. Dig holes large enough to permit the proper use of tampers to the full depth of the hole. Place backfill in the hole in 6 inch maximum layers and thoroughly tamp. Place surplus earth around the pole in a conical shape and pack tightly to drain water away.

3.1.3 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.

3.1.4 GROUNDING

Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.1.5 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test after 100 hours of burn-in time to show that the equipment operates in accordance with the requirements of this section.

-- End of Section --

SECTION 28 20 00.00 20

ELECTRONIC SECURITY SYSTEMS (ESS), COMMERCIAL
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C39.1	(1981; R 1992) Requirements for Electrical Analog Indicating Instruments

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTE)

SMPTE 170M	(2004) Television - Composite Analog Video Signal - NTSC for Studio Applications

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-232	(1997f; R 2012) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

UNDERWRITERS LABORATORIES (UL)

UL 1037	(1999; Reprint Dec 2009) Safety Antitheft Alarms and Devices
UL 1076	(1995; Reprint Sep 2010) Proprietary Burglar Alarm Units and Systems
UL 1610	(1998; Reprint Sep 2010) Standard for Central-Station Burglar-Alarm Units
UL 294	(2013) Access Control System Units
UL 497B	(2004; Reprint Dec 2012) Protectors for Data Communication Circuits
UL 681	(2014) Installation and Classification of Burglar and Holdup Alarm Systems
UL 796	(2010; Reprint Sep 2013) Standard for Printed-Wiring Boards

1.2 STANDARD PRODUCTS

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that have been in satisfactory use at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

a. Active mode: That in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected.

b. Fail-safe: The capability to monitor system functions and report an alarm when a failure is detected in a critical system function.

c. Installer: Either the Contractor or a subcontractor with whom the Contractor has a firm contractual agreement.

d. Intruder: An animate object at least 48 inches in height, 75 pounds in weight and 4 cubic feet in volume, moving through the protected zones or portals at a velocity of 0.1 to 10 feet per second.

e. Sensor zone: A geographic position for which an intrusion must be identified and displayed and may be the combination of multiple

detection devices.

f. Element: As used in this section means a constituent part of a complex signal such as an ac or dc voltage or current, ac phase, or frequency duration.

1.4 SYSTEM DESCRIPTION

Provide new Electronic Security Systems (ESS), including associated equipment and appurtenances. The design of the ESS shall include devices and equipment used to detect intrusion, control access to restricted areas, detect and deny unauthorized entries within specific areas, generate reports, produce Photo Identification badges, provide surveillance and annunciate alarms. The ESS shall be designed to provide operational flexibility and reliable performance. The ESS shall be modular, allowing for future incremental expansion or modification of inputs, outputs, and remote control stations. Integrated system capabilities shall include but not be limited to Intrusion Detection, Automated Access Control, Intercommunications, CCTV and Photo Badge Identification. Each system shall be complete and ready for operation and provide for a fully integrated central station solution. Include materials not normally furnished by the manufacturer with the ESS equipment as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

SD-02 Shop Drawings

ESS components; G

Overall system schematic; G

SD-03 Product Data

Card reader; G

Communications cable; G

Communications interface devices; G

CCTV camera; G

CCTV lenses; G

Auxiliary CCTV camera equipment; G

Video, Digital Video Recorder (DVR); G

Printer; G

Four quadrant multiplexer; G

SD-06 Test Reports

ESS operational test plan; G

SD-07 Certificates

ESS operational test plan; G

Installer's qualifications; G

Instructor's qualifications; G

SD-10 Operation and Maintenance Data

ESS components, Data Package 5; G

ESS software, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS.

SD-11 Closeout Submittals

As-Built drawings for ESS; G

1.6 QUALITY ASSURANCE

1.6.1 Drawings

1.6.1.1 ESS Components

Submit drawings that clearly and completely indicate the function of each ESS component. Indicate termination points of devices, and interconnections required for system operation. Indicate interconnection between modules and devices. In addition, submit a layout drawing showing spacing of components, location, mounting and positioning details.

1.6.1.2 Overall System Schematic

Indicate the relationship of integrated components on one diagram and show power source, system controls, impedance matches; plus number, size, identification, and maximum lengths of interconnecting wires. Drawings shall be not less than 11 by 17 inches.

1.6.2 Evidence of Experience and Qualifications

1.6.2.1 Installer's Qualifications

Prior to installation, submit data of the installer's experience and certified qualifications. Show that the installer who will perform the work has a minimum of 2 years experience successfully installing ESS of the same type and design as specified herein. Include the names, locations, and points of contact of at least two installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

1.6.2.2 Instructor's Qualifications

Prior to installation, submit data of the instructor's experience and certified qualifications. Show that the instructor, who will train operating and maintenance personnel, has received a minimum of 24 hours of ESS training from a technical organization such as the National Burglar and Fire Alarm Association, and 2 years experience in the installation of ESS of the type specified.

1.6.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.3.1 Reference Standard Compliance

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance

1.6.3.2 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard Provide only UL listed ESS equipment for Both exterior and interior ESS sensors, access control, and closed-circuit television (CCTV) components.

1.6.4 ESS Operational Test Plan

Submit at least 30 days prior to commencement of formal operational testing. Include detailed procedures for operational testing of each ESS component and subsystem, and for performance of an integrated system test.

1.6.5 User's Software Data

Submit for approval not later than 30 days prior to formal operational testing or instruction to Government personnel on ESS software, whichever is earlier. ESS software shall be documented in the user's manual.

1.6.6 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section

1.6.6.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished

1.6.6.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

PART 2 PRODUCTS

2.1 ESS SUBSYSTEMS

Provide a complete integrated ESS consisting of the following major subsystems:

a. Automated Access Control System

b. Communications

c. Closed-circuit television (CCTV)

d. Power

2.2 INTEGRATED SYSTEM FUNCTIONAL REQUIREMENTS

Ensure that ESS is fully integrated with physical security and other elements of the overall facility security system. Provide specific subsystem consisting of the following:

a. Automated Access Control subsystem: Electronic devices, access control units (ACU), sensors and software modules to detect intrusion attempts monitor and control personnel movement through normal access routes in and out of the facility and between protected areas within the facility.

b. Communications subsystem: Elements required to ensure that pertinent data is transferred from point of origin to point where appropriate actions can be taken.

c. CCTV subsystem: Electronic devices required to provide visual assessment of ESS alarms. Interface to ESS for control of camera call up to monitors, Pan-tilt-Zoom control, Video recording based on alarm event triggers. Integration shall provide the means to associate ESS archived alarm events with recorded video.

d. Power subsystem: Components required to ensure continuous operation of the entire ESS.

2.2.1 Growth Capability

Provide capability for modular ESS expansion with minimal equipment modification. Products provided shall not limit growth capability to products of a single manufacturer.

2.3 INTEGRATED SYSTEM PERFORMANCE REQUIREMENTS

The installed and operating ESS shall be integrated into the overall facility Control Access, provide Closed Circuit Television (CCTV) surveillance, provide visual verification and shall perform as an entity, as specified below.

2.3.1 Manual and Self-Test

PCU shall have a provision that permits testing from any alphanumeric keypad. The test shall include standby battery, alarm bell or siren, and communication to the SCC. A provision for an automatic, daily, weekly, thirty (30) day, or up to sixty (60)day communication link test from the PCU installation site to the SCC. Include a provision for displaying the internal system power and wiring conditions. Internal monitors shall include the bell circuit, AC power, battery voltage level, charging voltage, panel box tamper, phone trouble line 1, phone trouble line 2, transmit trouble, and network trouble. A battery test shall be automatically performed to test the integrity of the standby battery. The test shall disconnect the standby battery from the charging circuit and place a load on the battery. This test shall be performed no more than every 180 seconds.

2.3.2 Electrical Power

Obtain by the normal commercial or base electrical distribution system. Power shall be continuously monitored and, if interrupted, automatic switching from primary to emergency backup sources shall be accomplished without interruption or degradation of critical system function. Intrusion alarms shall not be generated as a result of power switching; however, an indication of power switching and on-line source shall be provided at the alarm monitor. Upon restoration of prime power, system shall automatically switch back to the primary source. Failure of an on-line battery shall be detected and reported as a fault condition.

2.3.2.1 Primary Power

Furnish 120 volt ac service, transformed through a two-winding isolation transformer and rectified to low-voltage AC or DC for system operation. Obtain primary power at the location indicated. Provide a separate,

lockable, fused safety switch at the location indicated.

2.4 SYSTEM PERFORMANCE REQUIREMENTS

Design system components to operate as described herein within the context of the overall system performance previously described. Perceived inconsistencies between the following component performance specifications and overall system level performance descriptions shall be decided in favor of the former.

2.4.1 Modularity

Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. Design system components to facilitate modular subassembly and part replacement.

2.4.2 Reliability

Provide only new components in current manufacturing production, manufactured to meet requirements specified herein, and free from characteristics and defects which affect appearance, or serviceability or render equipment unsuitable for the intended purpose. MTBF for component shall not be less than 5000 hours.

2.4.3 Maintainability

Components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be arranged and assembled to be readily accessible to maintenance personnel without compromising defeat resistance of ESS.

2.4.4 Availability

Provide components designed for continuous operation. Provide solid-state electronic components, mounted on printed circuit boards conforming to UL 796. Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. Power-dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Light duty relays and similar switching devices shall be solid-state type or hermetically sealed electromechanical. Electrical indicating instruments incorporated into system components shall conform to applicable provisions of ANSI C39.1.

2.4.5 Environmental Conditions

2.4.5.1 Interior Conditions

Equipment installed in environmentally protected interior areas shall meet performance requirements specified for the following ambient conditions:

a. Temperature: 32 to 120 degrees F. Components installed in unheated security protected areas shall meet performance requirements for temperatures as low as zero degrees F;

b. Pressure: Sea level to 15,000 feet above sea level;

c. Relative humidity: 5 to 95 percent;

d. Fungus: Components shall be constructed of nonfungus nutrient materials or shall be treated to inhibit fungus growth; and

e. Acoustical noise: Components shall be suitable for use in high noise areas above 100 dB, such as boiler rooms, power plants, and foundries without adversely affecting their performance.

2.4.5.2 Exterior Conditions

Components mounted in locations exposed to weather shall be housed in corrosion-resistant enclosures with appropriate environmental protection. Component performance shall not degrade because of improper housing design. Components in enclosures shall meet performance requirements when exposed to the following ambient conditions:

a. Temperature: Minus 25 to 140 degrees F;

b. Pressure: Sea level to 15,000 feet above sea level;

c. Solar radiation: Six hours of solar radiation at dry bulb temperature of 120 degrees F including 4 hours of solar radiation at 104 watts per square foot;

d. Sand and dust: Wind driven for up to 6 miles per hour;

e. Rain: 2 inches per hour and 5 inchesper hour cyclic with wind plus one period of 12 inches per hour;

f. Humidity: 5 to 95 percent;

g. Fungus: Warm, humid atmosphere conducive to the growth of heterotropic plants;

h. Salt fog: Salt atmosphere with 5 percent salinity;

i. Snow: Snow loading of 48 pounds per square foot (psf) per hour; blowing snow of 4.6 psf per hour;

j. Ice accretion: Up to 1/2 inch of radial ice;

k. Wind: Up to 50 mph with gusts to 66 mph, except that fence sensors shall detect intrusions up to 35 mph; and

l. Acoustical noise: Components shall be suitable for use in high noise areas above 110 dB, such as flight lines, runup pads, and generator sites without adversely affecting their performance.

2.4.5.3 Transient voltage surge suppression

Automated Access Control, CCTV video circuitry, and communication circuits that lead to the SCC shall be protected at both ends against transient voltage surges. Transient voltage surge suppressors (TVSS) or surge protection devices (SPD) are required for the protection, within specified limits, of AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients. Individual suppressors shall be installed where shown on the drawings.

a. Communication Lines: The following standard for separately mounted

telephone and signal line suppressors shall apply. All protectors shall be securely mounted at protected equipment location. All suppressors shall provide common (L-G) mode protection on all lines. Suppressors shall be tested in accordance with IEEE C62.36-1994 as a minimum. Protective interfacing with the telephone wire pairs shall be listed to UL 497B.

b. Data Line Protection: Solid state, silicon avalanche diode or metal oxide varistor circuitry for protection from over voltages on long cable runs employing standard RS-232, RS422, or RS485. Appropriate connectors shall be utilized to interface a remote station with a host CPU.

c. Signal Line Protection: Solid state, silicon avalanche diode and metal oxide varistor hybrid circuitry for protection from over voltages on 2 or 4 wire signal lines such as balanced pair telephone, metallic pair telephone, buried and overhead field cable, remote radio equipment, and control systems. Unit shall have an LED diagnostic lamp that lights if unit needs replacement. Unit shall be listed UL 497B.

d. Modular, Twisted Pair Protection: Solid state, silicon avalanche diode or metal oxide varistor circuitry for protection from over voltages on twisted pair data or audio lines. Protectors shall clip mount on 66 punch down blocks furnished with grounding bar or studs and shall be totally enclosed. Units shall be securely mounted at terminal locations where shown and shall be grounded to the main building ground with a minimum No.12 stranded copper green insulated ground conductor kept as short as possible. Ground terminals shall be screw insertion lug type. No crimp, fork or ring type permitted. Unit shall have a multi-function diagnostic LED that shows continuity, ground present, unit function and line status.

e. Coaxial Cable Protectors: Solid state, silicon avalanche diode, metal oxide varistor and/or gas tube circuitry for non-interrupting over voltage protection of coaxial cable. Unit shall be provided with one female input connector and one female output connector. Securely mount adjacent to protection equipment and ground to equipment or local building ground if an equipment ground is not available.

2.4.6 Electromagnetic Interference (EMI)

ESS components employing electromagnetic radiation shall be designed and constructed to provide maximum practical invulnerability to electronic countermeasures.

2.4.7 Interchangeability

Like components shall be physically and functionally interchangeable as complete items, without modification of either the original items or of other components with which the items are used.

2.4.8 Safety

ESS components shall conform to application rules and requirements of NFPA 70 and applicable UL publications.

2.4.9 Human Engineering

Displays, other than wall-mount LCD, Plasma or DLP displays, shall be

housed in standard desk-type consoles or 19 inch racks. Central alarm reporting and display shall be designed for operation by one or more individual(s). Aural considerations shall include location of annunciators, tone pitch, quality, and intensity. Number of different audible signals shall not exceed four. Component design shall provide for ease of accessibility for maintenance.

2.4.9.1 Visual Annunciators

Annunciators shall be either liquid crystal displays (LCDs), Plasma Display, DLP projection Display or light emitting diodes (LEDs). Annunciators shall be so connected in the circuit that a failure of the annunciator, socket, or protective circuitry shall not result in an improper or indeterminate signal. LCD Displays, Plasma Display, DLP projection Display and LEDs shall be compatible with standby power supplies. LCDs shall be back-lit with a minimum 800:1 contrast ratio. Plasma and DLP projection shall produce no less than a 3000:1 Contrast ratio.LEDs shall be brightly lit and visible from a distance of 30 feet in an area illuminated at 75 footcandles. Use LEDs in outdoor applications or in the presence of sunlight. Signals shall be clearly visible from a distance of 30 feet in an area illuminated at 75 footcandles. LCDs and LEDs shall be used for remote display to provide status indications within a secured area. LCDs, Plasma Displays and DLP projection Displays shall be used in Central monitoring Stations and interfaced to the ESS Servers, and workstations.

2.4.9.2 Controls

Provide to ensure ease of operation of specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals and indicating devices, input and output connectors, terminals, and test points shall be clearly marked or labeled on the hardware to permit quick identification, intended use, and location. Terminal markings and labels shall be of a permanent and legible type and located to be visible when associated system wiring is in place. Identification markings shall be associated with each adjustment device or item requiring periodic maintenance. Safety warning or cautions shall be marked in conspicuous red letters. Control and indicator identifications that are exposed outside enclosures shall be permanent, machine-engraved letters, painted to contrast with background color. Controls not required for system operation shall be inaccessible to the system operator.

2.4.10 Computer Software

Software shall be comprised of computer programs and computer data bases as required. Software shall be categorized as mission software and support software.

2.4.10.1 Mission Software

Mission software shall consist of software implemented to provide complete operation of the ESS.

2.4.10.2 Support Software

Support software shall consist of software implemented to support system operation, such as system setup and off-line maintenance routines.

2.4.10.3 Software Performance Requirements

Provide software in modules to meet application requirements of this section. Software shall include the operating system (OS), be complete off-the-shelf, modifiable for specific ESS application specified herein, and be a product of and supported by the ESS central processor manufacturer. OS executive shall accomplish in real time the scheduling and sequencing of programs for execution. Each program shall be assigned a priority level. Provide priority levels in sufficient number to provide total functional operation as specified. Software shall be menu-driven. Menu, reconfiguration, and other actions which could in any way compromise the security and integrity of the ESS shall be password controlled. A minimum of eight password levels shall be provided. Software provided shall be documented in a user's manual which shall be approved by the Government prior to system implementation.

2.4.11 Test Points

Test points, controls, and other adjustments inside enclosures shall be readily visible and accessible with minimum disassembly of equipment. Test points and other maintenance controls shall not be readily accessible to operator personnel.

2.4.12 Component Enclosures

Consoles, annunciator housings, power supply enclosures, sensor control and terminal cabinets, control units, wiring gutters, and other component housings, collectively referred to as enclosures, shall be formed and assembled to be sturdy and rigid.

2.4.12.1 Metal Thickness

Thicknesses of metal in cast and sheet metal enclosures of all types shall be not less than those listed in Tables 8.1, 8.2, and 8.3 of UL 1610for alarm components, and NEMA ICS 2 and NEMA ICS 6 for other enclosures. Sheet steel used in fabrication of enclosures shall be not less than 16 gage, except consoles may be 18 gage.

2.4.12.2 Doors and Covers

Doors and covers shall be flanged. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type, or the ends of hinge pins shall be tack welded to prevent ready removal. Provide doors having a latch edge length of less than 24 inches with a single lock. Where latch edge of a hinged door is 24 inchesor more in length, provide the door with a three-point latching device with lock; or alternatively with two locks, one located near each end. Covers of junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws.

2.4.12.3 Ventilation

Ventilation openings in enclosures and cabinets shall conform to requirements of UL 1610.

2.4.12.4 Mounting

Unless otherwise indicated, sheet metal enclosures shall be designed for wall mounting with top hole slotted. Mounting holes shall be in positions

which remain accessible when major operating components are in place and door is open, but shall be inaccessible when door is closed.

2.4.12.5 Labels

Labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the intrusion detection system.

2.4.12.6 Enclosure Locks

Locks and key-lock-operated switches required to be installed on component enclosures shall be UL listed, round-key type with three dual, one mushroom, and three plain pin tumblers, or shall have a pick resistance equal to a lock having a combination of five cylinder pin and five-point three-position side bar in the same lock. Keys shall be stamped "U.S. GOVT. DO NOT DUP." Key-lock-operated switches shall be keyed differently and shall be two-position, with the key retractable from either position. Furnish two keys for each switch. Maintenance locks shall be of the one-way key-pull type arranged so that the key can be withdrawn only when the lock is in the locked position. Locks on components for maintenance access shall be keyed alike; only two keys shall be furnished for such locks. Deliver keys, tagged with metal tags, accompanied by a manufacturer's certificate which records the number of each key made.

2.4.13 Automated Access Control System (AACS)

Provide Automated access control system based upon a modular distributed microprocessor architecture complete with access control cards and ready for operation. System shall provide monitoring and control for the ESS. System shall meet the Grade AA communications requirements of UL 1076 and UL 294 and shall have the capability of controlling up to 4 card reader and keypad per card reader controller. System shall grant or deny access or exit based upon keypad identification data, card identification data, or a combination of identification technologies, input through the access control devices compared to data stored within the system, as well as time of day and day of week. Decision to grant or deny access or exit shall be based upon authorization for such data to be input at a specific location for the current time period.

The AACS primary functions shall be to regulate access through specific doors or portals to secured areas. The AACS shall utilize a single database for its access control that shall seamlessly integrate with the ESS. The AACS shall be able to control 32 alarm inputs, or 128 relay outputs or any combination of these components.

The AACS shall support configuration and simultaneous monitoring of multiple access control devices when TCP/IP communication interfaces are used between the ESS and the primary Access Control Units (ACU). The events of the AACS shall be viewable as separate or as a combined list of all ESS events. Overall control of the AACS, alarm monitoring, and photo identification shall be through software control of the ESS.

All AACS programming data shall reside on a single database and shall be instantly accessible to every networked PC workstation connected to the ESS.

AACS functions shall include validation based on time of day and day of week, special day/holiday scheduling with card validation override, video image storage, access validation based on positive verification of card.

AACS shall provide both supervised and non-supervised alarm point monitoring. The system shall be capable of arming or disarming alarm points both manually and automatically by time of day, day of week or by operator command. The system shall be capable of disarming alarm points based on a valid access event.

The AACS shall provide programmable 'delay' setting for all alarm points. The alarm points shall not report an ENTRY type alarm condition until the delay setting has expired. The system shall not report a DWELL type alarm condition until the alarm has been active for the full delay period.

The AACS shall provide capability to place ACU(s) in an off-line mode. In the off-line mode, the ACU(s) shall retain a historical summary of all ACU activity transactions, up to the maximum capacity of the ACU memory buffer. The system shall provide ability for manual operator control of system output relays. The manual functions shall include the ability to energize, de-energize, enable or disable.

The AACS shall provide ability to display stored 'video image' of cardholder based on card activity, and switch real-time CCTV camera to card reader location for specific card usage. The card reader shall not activate the door lock until positive operator acknowledgment from the SCC.

The AACS software shall be capable of, but not limited to, the following programming:

(1) Time Schedules: Up to 254 user-definable time schedules shall be provided. These time schedules shall determine the day(s) and times that access will be granted or a scheduled event shall occur. Any and all of the time schedules shall be available for defining access privileges and scheduled events. There shall be ALWAYS and NEVER schedules that cannot be altered or removed from the system. Each user-defined time schedule shall have the option of reacting or not reacting to user-defined special days, with the ability to react uniquely to each type of special day.

(2) Special Days: There shall be an unlimited number of user definable special days. These days shall be used for configuring exceptions to the normal operating rules, typically for specifying holiday operating rules. Each special day shall be assigned to a type, with each type defined by the user.

(3) ACU Daylight Savings Time Adjustment: There shall be a software-configurable, user defined adjustment for Daylight Savings Time. The ACU shall not need to be connected to a PC workstation in order for the adjustment to occur.

(4) Scheduled Events: Any access controlled reader shall be capable of scheduled unlock periods to allow for card-free access. The access controlled reader shall also be capable of requiring one valid access event before beginning a scheduled unlock period. Additionally, any access control point shall be capable of requiring a valid card as well as a PIN code via keypad on a scheduled basis for high security areas. The use of PIN via keypad functions shall not reduce the number of card reader or alarm points available in the ACU(s). Any designated alarm input shall be able to be scheduled Armed and Disarmed. Any relay output shall be capable of scheduled On and Off periods to allow for automatic I/O system control.

(5) Maximum User Capability: Up to 100 individual users may be given access cards or codes and have their access controlled and recorded.

(6) Access Groups: Each system user shall be assignable to a maximum of 4 of 8 possible access groups. An access group shall be defined as one or more people who are allowed access to the same areas at the same days and time periods.

(7) Active/Expire Dates: Any card/user may be configured with activation and expiration dates. The card can be assigned to any valid access group and will be activated and expired according to the specified dates.

(8) Maximum Use Settings: Any card/user may be configured with maximum number of uses for that card. The card can be assigned to any valid access group and will be expired according to the specified number of card uses.

(9) Door Outputs: Each access control reader shall have two dedicated relay outputs. Both relays shall provide Normally Open and Normally Closed contacts. The first relay shall be used for electric lock control. The second shall be software configurable to activate for door forced open, door left open too long, duress, passback violations, invalid access attempts and valid unlock conditions. Both relays shall be separately programmable for energize times from 1 second to 10 minutes. The second relay shall allow a delay time to be specified, causing its activation to be delayed after an activating condition occurs.

(10) Anti-Passback: The AACS shall have global anti-passback capability. Any door on the system can be linked to one of 254 user defined passback areas or two 2 pre-defined areas. Each door may be set up to automatically forgive passback entries at the following intervals: Never, at Midnight, every 12 hours (Midnight and Noon), every 6 hours, every 2 hours, each hour or every 30 minutes. Each door can be configured to deny or grant access for passback violations and individual users can be exempt to the passback rules. The anti-passback features shall be a global function and operate completely independent of the AACS software with the exception of configuring the passback rules. Additionally, the operator shall have the ability to manually forgive an individual user or all users by command from the AACS.

(11) Two Person Rule: Any access control reader on the system shall have the ability to require two valid cards for access. This feature shall be software programmable. Any access control reader on the system that includes a keypad shall also have the ability to require a valid PIN number associated with each of the two valid cards.

(12) User List/Who's In (Muster Reports): The AACS shall be capable of generating dynamic lists of users in certain access-controlled areas, based either upon selected users or selected areas. The lists shall have the option of automatically refreshing after a user-selected interval of time.

(13) Crisis Mode: The AACS shall support "crisis mode", in which the activation of user-selected alarm points causes changes to user access privileges. The changes to user access privileges shall be configurable to restrict normal access to no access or limited access.

(14) Door Groups: The system shall allow up to 2 door groups to be configured. Doors belonging to the same group shall be able to be locked, unlocked, disabled and enabled on command from the AACS.

(15) Door Interlocking: The system shall allow a group of doors to be software configured so that if any door in the group is unsecure, all other doors shall be automatically disabled. This feature also known as "mantrap" configuration. The interlocking features shall not require the AACS to be on-line for proper operation.

(16) PIN Required: The AACS shall support the required use of a keypad code, in addition to a valid credential, at user-selected doors, during user-selected schedules.

(17) Remote door control: The SCC operator shall have the capability of manually controlling any access point by issuing a simple command from the AACS. The operator shall have the ability to lock, unlock, enable, disable and pulse any door in this manner. This activity shall cause an entry to be logged displaying the door name, number and time that it was performed. Additionally, the operator shall have the ability to lock, unlock, enable and disable any group of doors in a Door Group by a single command from the AACS.

(18) Key Control: When interfaced with an approved key-control system, the system shall allow users to deny access to certain doors to any users who have keys in their possession.

(19) Guard Tour: The AACS shall support user-defined guard tours. The tour may be configured in a set pattern of tour points, or may follow a mode in which all tour points can be visited in any order within an allotted time. The AACS shall allow a tour to be started by AACS-command, by use of a selected card at a selected reader, or by use of a selected keypad code at a selected keypad. The system shall detect guard late-to-point; point missed, and point out-of-sequence events. The system shall generate a report at the completion of a tour.

(20) Reader Disable: The AACS shall support disabling readers in reaction to a user-selected number of invalid access attempts.

(21) Disable Event Messages: The AACS shall allow users to disable user-selected event messages (Door Forced Open, Door Open Too Long, Door Closed, Request to Exit) for user-selected doors. The AACS shall allow users to disable certain messages (Door Forced Open, Door Open Too Long) according to a user-selected schedule.

(22) I/O Groups: The AACS shall allow up to 255 user-defined I/O (input-output) groups to be defined. Each Input device shall be able to be linked to these groups for arming, disarming, shunting and unshunting as well as output control.

(23) Delays: Each alarm device shall allow a delay to be specified. The delay shall be either an entry type or a dwell type. An entry-type delay shall prevent the input from issuing an alarm event until the delay elapses. If unarmed during the delay period, the alarm condition shall be ignored. A dwell-type delay shall require the input to remain in the alarm state for the full duration of the delay before issuing an alarm condition.

(24) Remote Input control: The operator shall have the capability of

manually controlling any alarm/input point by issuing a simple command from the AACS. The SCC operator shall have the ability to shunt, unshunt, disable and restore any input in this manner. This activity shall cause an entry to be logged displaying the input name and time that it was performed. Additionally, the operator shall have the ability to arm, disarm, shunt and unshunt any alarm partition/group by a single command from the SCC. The arm disarm, shunt and unshunt any alarm partition/group from the SCC shall not be permissible in DIA DCID 6/9 applications.

(25) Output Configuration: Each output relay shall be software configurable as a FOLLOWS, LATCH, TIMEOUT, SCHEDULED, TIMEOUT RETRIGGERABLE, LIMIT, or COUNTER type. The SCHEDULED type shall allow a time schedule to automatically control its activation and de-activation. The FOLLOWS, LATCH, TIMEOUT, TIMEOUT RETRIGGERABLE, LIMIT and COUNTER types shall be configured to activate based on the condition of I/O groups. Additionally, a time schedule shall be specified to configure when the output shall actively monitor the I/O groups.

(26) Remote Output control: The operator shall have the capability of manually controlling any output point by issuing a simple command from the SCC. The SCC operator shall have the ability to ENABLE, DISABLE, turn ON and turn OFF any output in this manner based on the output type. A FOLLOWS type output shall not be capable of being turned OFF or ON. This activity shall cause an entry to be logged displaying the output name and time that it was performed. manual control of outputs shall not be permissible in DIA DCID 6/9 applications.

(27) Remote Reset Command: Any ACU shall have the capability of being reset manually or by command issued from the AACS. This reset command shall have the option of simulating the ACU reset settings, or forcing a reset type as specified by the user. The remote reset command shall not cause the ACU to degrade its level of protection to any access points defined.

(28) Dial Out: The ACU shall have the capability of using a modem to automatically connect to the AACS when a critical alarm or service event occurs. The conditions triggering the dial out capability shall be user defined and software configurable.

(29) Time Zone: The AACS shall allow the user to select the time zone in which the ACU is located, so that event times displayed for that ACU will match the local time where the ACU is located.

(30) User-Selected LED Behavior: The AACS shall allow the user to select different behaviors for the LEDs of each access controlled reader.

(31) Traced Cards: The AACS shall be capable of selecting any number of cardholders for the purpose of limiting reports to only traced users. The AACS shall be capable of displaying all traced cardholder events in a user-selected alternate color.

(32) Badge Print Tracking: The AACS shall support setting a print limit for any badge. The software will track the number of times any badge has been printed, as well as display the date and time of the most recent printing.

2.4.13.1 Error and Throughput Rates

Rates shall be portal to portal performance averages obtained when processing individuals one at a time. When serial verification techniques or multiple attempts are required to satisfy error performance requirements, features shall not reduce capability to meet throughput requirements. A Type I error denies access to an authorized enrolled individual. A Type II error grants access to an unauthorized individual. Subsystem Type I and Type II error rates shall be both less than 0.1 percent. At the error rates, subsystem access throughput rate shall be minimum of 12 individuals per minute through one card reader and keypad access control device.

2.4.13.2 Access Control Subsystem Central Processing

Provide serial management and control of subsystem. Provide a microprocessor control device designed to monitor and control units and up to 8 card reader and keypad access control devices. Central processor shall interrogate and receive responses from each ACU within 100 milliseconds. Failure to respond to an interrogation shall cause an alarm. Provide a printer with a minimum print rate of 30 characters per second to produce hard copy of subsystem events. Provide the central processor with an TIA-232 interface port to communicate with the printer. Provide an operator interface to control system operating functions. Provide the central processor with a facility-tailorable data base for a minimum of 100 card holders with by-name alphanumeric printout, and for automated subsystem monitoring, management, and control functions. Provide enrollment equipment to process access control cards and enroll personnel into and disenroll personnel from the subsystem data base. Enrollment equipment shall not be accessible to ESS operations personnel. Provide a minimum of 150 percent of the number of card holders specified above access control cards with the enrollment equipment. Provide system configuration controls and electronic diagnostic aids for subsystem setup and troubleshooting with the central processor. Components shall not be accessible to operations personnel. Central processor components shall be tamper alarmed.

2.4.13.3 Access Control Unit (ACU)

The ACU shall be micro-processor based with all access and I/O decisions to be made by the individual ACU(s). The ACU shall be of modular design which will allow for present security requirements and the capability to expand. All field ACU panels shall be configured to intercommunicate via RS-422/485 or RS-232 hardwired, Dial-up, TCP/IP or fiber-optic communication. All field ACU(s) shall be equipped with a tamper contact. One ACU shall be designated a "Primary", responsible for all AACS-to-ACU communications. All other ACU(s) up to a maximum of 16 shall be designated "Secondaries" and shall communicate with the "Primary" via an RS-422/485 hardwire, TCP/IP network or fiber-optic configuration. The ACU shall be capable of, but not limited to, the following:

(1) All ACU(s) shall have built-in surge suppression circuitry on plug-in modular circuit boards. The surge protection, designed as an integral component of the system, shall be self-sacrificing in the event of extreme surges or spikes.

(2) Each ACU shall be capable of supporting at least 2 ports and be expandable in increments of two ports up to a maximum of 16 ports per ACU.

(4) Each ACU port shall be configured by AACS to support any one of the following peripheral devices: Card reader or, Output Relay Module. Any combination of these devices can be supported on each ACU, up to a total of 8 devices per ACU.

(5) Each ACU shall have the capability of supporting multiple card reader technologies simultaneously, including Transmissive Infrared, Wiegand, Magnetic stripe, Proximity, Barcode, Keypad, Card/Keypad, Smart Card, and Biometrics. This capability shall be an integral part of the ACU and will not require special external equipment.

(6) Each ACU shall have built-in battery back-up of programmed information and shall be sustainable for a period of not less than ninety days.

(7) Each ACU shall be powered by a 12VDC power source rated at a minimum of 2 amperes. The power supply shall have a battery back-up for complete system operation in the event of power failure. Provide battery backup for all ACU(s) to sufficiently power the ACU for 48 hours continuous service.

(8) Electric strikes, other locking devices and ancillary peripherals shall have a separate power supply. Battery back-up shall be utilized for continued operation in the event of power failure.

(9) There shall be a minimum of a 10,300 event log buffer per ACU. The log buffer shall be used to record and hold access and alarm activity information until the AACS is connected and receives the information. There shall be a software-configurable warning notification of log buffer filling for ACU(s) configured with modem capabilities.

2.4.13.4 Card Reader Access Control Devices

Devices shall be tamper alarmed, tamper and vandal resistant, and solid state, containing no electronics which could compromise the access control subsystem should the subsystem be attacked. Devices shall be surface, semiflush, pedestal, or weatherproof mountable as specified for each individual location. Card readers shall be the proximity type and shall be capable of reading proximity type access control cards.

2.4.13.5 Access Control Cards

Cards shall be manufactured with capability of modification and lamination during enrollment process without reduction of readability for use as a picture and identification badge. Cards shall contain binary coded data arranged in a scrambled pattern as a unique identification code stored on or within the card and of the type readable by the subsystem card readers. No identifiable logo or wording is required on the card.

2.4.14 Communications

Communications shall link together subsystems of the ESS. ESS communications links shall be via hardwire (cable). Communications links shall be supervised. Common communications interface devices shall be provided throughout the ESS. Sensor to control unit interface shall be by dry relay contact normally open or normally closed, except as specified otherwise. Control unit to central alarm reporting and display processor interface shall be digital, asynchronous, or multiplexed data. Individual data bits shall be grouped into word format and transmitted as coded

messages. Interface shall be implemented by modems which function as a communications controller, perform data acquisition and distribution, buffering message handling, error checking, and signal regeneration as required to maintain communications.

2.4.14.1 Link Supervision

a. Hardwire direct current line supervision: Provide only for sensor to control unit links which are within ESS protected area. Circuit shall be supervised by monitoring changes in the current that flows through the detection circuit and a terminating resistor of at least 2.2 kohms. Supervision circuitry shall initiate an alarm in response to opening, closing, shorting, or grounding of conductors by employing Class C, standard line security. Class C circuit supervisor units shall provide an alarm response in the annunciator in not more than one second as a result of the following changes in normal transmission line current:

(1) Five percent or more in normal line signal when it consists of direct current from 0.5 through 30 milliamperes.

(2) Ten percent or more in normal line signal when it consists of direct current from 10 microamperes to 0.5 milliampere.

(3) Five percent or more of an element or elements of a complex signal upon which security integrity of the system is dependent. This tolerance will be applied for frequencies up to 100 Hz.

(4) Fifteen percent or more of an element or elements of a complex signal upon which the security integrity of the system is dependent. This tolerance will be applicable for all frequencies above 100 Hz.

b. Hardwire alternating current supervision: Supervision shall not be capable of compromise by use of resistance, voltage, or current substitution techniques. The method shall be employed on circuits which employ a tone modulated frequency-shift keying (FSK), interrogate-and-reply communications method. Supervisory circuit shall be immune to transmission line noise, crosstalk, and transients. Detection circuit shall be terminated by a complex impedance. Supervision of the line shall be maintained by monitoring current amplitude and phase. Complex impedance shall be sized so that current leads or lags the driving voltage by 45 plus or minus 5 degrees. For supervision currents of 0.5 to 30 milliamperes root mean square (rms), an alarm shall result when rms current changes by more than 5 percent, or phase changes by more than 5 degrees. For lines with supervision currents of 0.01 to 0.5 milliampere, an alarm shall result when rms current changes by more than 10 percent, or phase changes by more than 8 degrees. Identified line supervision alarm shall be communicated within one second of the alarm condition.

c. Hardwire digital supervision: Modems at both ends of circuit shall exchange digital data to indicate secure or alarm condition at least every 2 seconds. For passive supervisory circuits, an alarm shall sound if data is missed for more than one second. Coding used for data shall not be decipherable by merely viewing data on an oscilloscope. For transponder schemes, supervisory circuit shall asynchronously transmit bursts of digital data. Data pattern shall be random in nature. Remote detectors shall receive data and encode a response

based on a proprietary coding scheme. Each ESS shall have a unique encoding scheme; an industry-wide or vendor standard is not acceptable. Encoded response shall be transmitted back to supervisory circuit. Supervisory circuit shall compare the response to an anticipated response. Failure of the detector to return a data burst, or return an incorrect response, shall initiate an alarm.

d. RF link supervision: System shall consist of link supervision components which provide a line supervision alarm declaration at the annunciation end of the link in approximately 2 seconds after the system has verified a problem by repeating the same signal no less than nine times during a period of 30 seconds or less.

2.4.14.2 Hardwire

a. Hardwire shall utilize electrical conductor lines. Alarm electrical lines shall not rely on current path except for electrical wires; neutral conductors of electrical distribution systems shall not be used as signal transmitters. Conductors outside the protected area shall be installed in rigid galvanized steel conduit as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Supervision circuitry shall not initiate nuisance alarms in response to normal line noise, transients, crosstalk, or in response to normal parametric changes in the line over a temperature range of minus 30 to 125 degrees F. Ambient current levels chosen for line supervision shall be sufficient to detect tampering and shall be within the normal operating range of electrical components. Line supervision and tamper alarms shall be reported regardless of mode of operation. Provide hardwire links as specified in UL 1076 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM for interior applications with additions and modifications specified herein. Conductors shall be copper. Conductors for links which also carry ac voltage, shall be No. 12 AWG minimum; single conductors for low-voltage dc links shall be No. 14 AWG minimum. Conductors shall be color coded. Conceal wiring in finished areas of new construction and wherever practical in existing construction if not otherwise precluded by the Government. Identify conductors within each enclosure where a tap, splice, or termination is made. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Connect sensors, control units, and communication devices so that removal will cause a tamper alarm to sound. Pigtail or "T" tap connections are not acceptable. Each conductor used for identical functions shall be distinctively color coded. Each circuit color code wire shall remain uniform throughout circuit.

b. Communication link from sensor to control unit shall be by dedicated circuit. An alarm condition shall be indicated by the opening or closing of a relay contact. Analog signals shall be converted to digital values or a relay closure or opening within 250 feet of the sensing point. Communications from control unit to central alarm reporting and display processor shall operate in a continuous interrogation and response mode, using time-multiplexed digital communications techniques at a data rate of 5.12 kilobaud. Interrogation and response communications between the control unit and central processor shall be half-duplex, bidirectional on one dual twisted pair cable, one pair for interrogation, one for response, which may have one or more parallel branches. Individual control unit lines shall be 22 AWG or larger wire. Connect control wires in parallel to the hardwire link. Communications system shall provide for connection of as many as 255 control units. When operating without line repeaters

or other signal regenerating or amplifying devices, communication system shall maintain specified performance over a link length of 7500 feet. When operating with signal-regenerating line repeaters, communications system shall maintain specified performance over a link length of 75,000 feet. Control unit to central alarm reporting and display processor communications link shall also be capable of operating over a maximum of two standard voice grade telephone leased or proprietary lines. Link shall be capable of operating half duplex over a Type 3002 data transmission pair and be capable of modular expansion. Telephone lines shall be provided by the Government. Coordinate and check out system operation. General characteristics and telephone line service shall be as follows:

(1) Connections: Two- or four-wire

(2) Impedance at 1000 Hz: 600 ohms

(3) Transmitting level: 0 to 12 dBm

(4) Transmitting level adjustment: 3 dB increments

(5) Type: Data

(6) Direction: Two-way alternate (half duplex)

(7) Maximum speed: 1.2 kilobaud

(8) Maximum loss at 1000 Hz: 33 dB.

c. Video hardwire links shall be as specified in paragraph entitled "Video Transmission."

2.4.15 Closed-Circuit Television (CCTV) System

Provide UL Listed CCTV components to provide visual assessment of ESS alarms. Subsystem shall continuously view remote areas with video cameras and display the areas automatically upon ESS alarm, or upon SCC operator selection. Provide the number of alarm monitors as required. Video systems shall be capable of automatic and manual operation. In systems where monitors may display more than one camera scene, provide on-screen camera identification. Subsystem shall be composed of components which are integrated to provide a quality video surveillance system. The scene from each camera shall appear clear, crisp, and stable on the respective monitor during both daytime and nighttime operation. Component equipment shall minimize both preventive and corrective maintenance. Components shall be compatible with other components and with system as a whole and shall, to the greatest extent possible, be supplied by the same manufacturer.

2.4.15.1 Cameras

a. Except as specified herein, CCTV camera shall comply with SMPTE 170M for standard monochrome or color camera and shall:

(1) Camera: shall utilize digital signal processing (DSP) to produce a high picture quality. Day/Night (Color/B&W) fixed or pan-tilt-zoom (PTZ) cameras are to be used in all outdoor environments. Standard DSP fixed or PTZ cameras are to be used for all indoor applications except when backlighting issues are observed. For backlighting or high contrast applications, use

Day/Night cameras or standard cameras with backlighting compensation.

(2) All PTZ cameras shall feature a direct drive motor assembly. Belt driven PTZ camera units are not acceptable. All PTZ cameras shall be equipped with a slip ring assembly having an optical interface and be rated for continuous duty. PTZ cameras shall be fully integrated units. The pan-tilt mechanism shall be an integral part of the camera.

(3) Be identified with the manufacturer's part number, model number, lens installed, and a serial number;

(4) Operate over a voltage range of 105 to 130 volts ac or low voltage 12 to 24 volts ac at 60 Hz;

(5) Have electronic circuits which use solid-state devices.

(6) Be constructed to provide rigid support for electrical and optical systems so that unintentional changes in alignment or microphonic effects will not occur during operation, movement, or lens adjustments;

(7) Have standard C or CS lens mount;

(8) Be designed to protect personnel from exposure to high voltage during operation and adjustment; and

(9) Meet requirements specified herein with either side of the power source line grounded. Minimum essential requirements shall include the following:

(a) Sensitivity: Minimum Illumination: 0.8 lux (0.08 fc) at F1.4 color mode; 0.1 lux (0.01 fc) at F1.4 in the B&W mode.

(b) Signal-to-noise ratio: Show a signal-to-noise ratio of not less than 50decibels (dB) at AGC "Off", weight "On".

(c) Resolution: Provide a horizontal resolution of at least 480 lines in color and 570 line in B&W with automatic gain and bandwidth at the specified sensitivity.

(d) Digital Signal Processing: Cameras shall have Digital Signal Processing (DSP) technology to produce clear, high quality video images.

(e) Synchronization: Internal, line lock or multiplexed Vertical Drive Selectable.

(f) Day/Night cameras shall feature a B/W mode that may be automatically engaged on low light level and permit the use of an external infrared illuminator. Removal electronically of the color signal is not acceptable. The camera shall feature an infrared cut filter capable of being removed automatically upon low light threshold or manually.

(g) Geometric distortion: Camera shall be accurate to within a maximum 1.5 percent geometric distortion in Zone 1 and to within 2 percent in Zones 2 and 3.

b. Camera signals: CCTV camera vertical sync signal shall be phase-locked to the ac power line frequency and shall remain line locked at 60 Hz, plus or minus 0.3 Hz. Synchronization at the video output shall conform to the timing specified by SMPTE 170M. Camera shall operate on internally generated sync automatically upon loss of external sync.

c. Camera resolution

(1) Exterior: Horizontal resolution shall be 480 TV lines in the center in the color mode and 570 lines in the black & white mode, Vertical resolution shall be 350 TV lines in the center. Resolution shall be maintained over the specified input voltage and frequency range, and shall not vary more than 100 TV lines from minimum specification over the specified operating temperature range. Composite video output level shall be automatically maintained to within plus or minus 0.1 volt over scene changes of 0.25 footcandle to 1 by 104 footcandles with lenses of f/1.4 and greater.

(2) Interior: Horizontal resolution shall be at least TV lines. Vertical resolution shall be at least 350 TV lines. 480Resolution shall be maintained over the specified input voltage and frequency range.

d. CCTV lenses: Provide lenses with automated light level metering device and an auto-iris. Provide each lens with a metal density spot filter. Light adjustment by the automatic metering device shall be a weighted average rather than a simple average or a peak response. Provide lenses for 1/3 and 1/4 inch format cameras. Provide lenses which are mountable with standard C or CS mounts.

e. Auxiliary CCTV camera equipment: Equipment shall consist of camera mounts and housings with environmental protection as applicable for each camera. Camera mounts shall be heavy duty industrial type, shall provide stable support for the camera, and shall be the configuration specified for each individual camera location. Housing shall protect the camera to ensure continuous 24-hour per day operation under specified environmental conditions. Housing shall be constructed of a durable material. Access to housing shall allow for camera and auto-iris removal and replacement within plus or minus 0.5 degree, both vertical and horizontal centerline alignment. Sealed housings shall be pressurized with dry nitrogen, or contain two units of desiccant in the camera body area. Install a 10, 20, and 30 percent humidity level indicator strip in a position that allows inspection through the enclosure faceplate. Where used, thermostatically controlled heaters shall be located near the auto-iris and faceplate and near the midsection of the camera body. Where ventilation blower is used in housing to prevent high temperature, it shall be thermostatically controlled. Hinged louvers shall close over blower exhaust when blower is off. For exterior cameras, video, sync, tamper, and power cables shall enter camera housing via weatherproof fittings. Entry into housing shall not interfere with housing heaters or blower operation. Provide terminal strips for power inside environmental housings to distribute 120 volts ac for the camera, heater, and blower, as applicable.

2.4.15.2 Video Signal

Requirements apply to the video signal present at the video monitor input. Standard system video level shall be one volt peak-to-peak (Vp-p) composite video and sync. Standard system impedance shall be 75 ohms over the frequency range 0 to 5 MHz. System timing and synchronizing waveform shall be according to SMPTE 170M. Peak-to-peak amplitude of the composite TV waveform shall be one volt and shall be referred to as standard system video level. Waveform shall be measured in IRE units on the IRE scale graticule where 140 IRE units represent one volt. Synchronizing pulse amplitude of a composite video signal of standard system video level shall be measured from blanking level to negative peak of the sync pulse and shall be 40 IRE units, 0.3 volt nominal. Video amplitude of a composite video signal of standard system video level shall be measured from blanking level to reference white level and shall be 100 IRE units, 0.7 volt nominal. Picture setup of a composite video signal of standard system video level shall be 7.5 IRE units, 7.5 percent of the video amplitude. Pulse overshoot shall be less than 2 percent of the pulse amplitude. Video signal voltage frequency response shall be measured from camera output to video monitor input. It shall be plus or minus 2 dB from 60 Hz to 5 MHz and not more than 3 dB down at 6 MHz. The low frequency distortion shall be measured for every camera output over every normal program path to the input of the associated monitor. Distortion shall be less than 2 percent at line and field rates. Peak-to-peak signal-to-rms noise ratio shall be measured for every camera output via the normal program path at input of the associated monitor. Terminate circuits, except the one under test, at inputs and outputs. Hum and noise shall be 60 dB below 1.0 Vp-p.

2.4.15.3 Video Matrix Switchers

Switching shall interface multiple video signals, cameras, with one or more monitors. Switching shall be timed to occur during the video signal blanking period, vertical interval switching. When an ESS zone goes into alarm, a signal shall be sent from the alarm reporting and display processor to the switcher. When the zone is covered by CCTV cameras, switcher shall call up the camera views for display on one or more of the dedicated video monitors wired to the switcher. In the case of multiple alarms, applicable camera numbers shall be stored in an alarm queue until zones are manually called up for viewing. First video display out of the queue shall be from the last reported alarm. Active alarms shall cycle between the alarm queue and video monitors as various zones are called up for viewing. Alarms shall not leave the cycle until secured, reset or placed in access at the alarm reporting and display processor. Additionally, a sequential monitoring capability shall permit alarm reporting and display subsystem operation to view zones in numerical order at an operator adjustable scan rate. Individual cameras shall be capable of being called up to display zones on the video monitors. Manual controls for camera switching shall be from any remote controller connected to the Matrix switcher. Switcher shall be configured for desk top console operation. Performance requirements shall be as follows:

a. Modular construction shall enable 16 camera inputs and 4 monitor outputs.

b. Matrix switcher shall provide optional alarm and communication boards.

c. The Matrix switcher shall allow 1 remote controllers for system control and operation.

d. Alarm modes shall be automatically enabled or disabled by time of day and day of the week.

e. Operator Registration and System Partitioning: Up to 4 operator(s) can be registered in a system with different operator access levels. Password protection shall be available to limit operator access. Operator priority shall be available to lock out lower priority operators and to limit operator access to specific cameras and controls.

f. Video connectors: BNC.

2.4.15.4 Video Transmission

Transmission shall be by 75-ohm coaxial cable , twisted pair or fiber optics dedicated to the associated circuit.

Interior cable shall be installed in conduit unless indicated otherwise. Cable shall be designed for the installation method intended. Exterior cable runs shall be underground.

a. Coaxial cable: Coaxial cable used shall provide a DC resistance rating of less than 15 ohm/1000', solid copper center conductor and 95 percent braided, pure copper shield.

b. Twisted pair wire: Use point to point unshielded twisted pair wire, 24-16 AWG, stranded or solid, Category 2 or better. The video signal may co-exist in the same wire bundle as other video, telephone, data, control or low voltage power. The wire shall be installed with no bridge-taps, loading coils, talk-battery or MOV type protectors. The high bandwidth signal will not pass through a telephone switching system, however multiple punch-blocks are okay.

c. Twisted pair wire distance: Distance includes any coax in the path. Wire distance shall be measured to ensure the capability of the product is not exceeded. Wire resistance may be measured with an ohm meter by shorting the two conductors together at the far end and measuring the loop resistance out and back.

d. Twisted pair wire with DVR: When using a digital video recorder, reduce distance by 25 percent due to lower tolerance of the digital video recorder to synch level and overall video signal quality.

2.4.15.5 Color Video Monitors

a. Except as specified herein, design video monitors to comply with SMPTE 170M for distribution monitors and:

(1) Video monitors shall be designed for continuous operation and shall incorporate printed circuit modular construction.

(2) Monitor design shall provide for easy replacement of printed circuit modules.

(3) Electronic circuits shall use solid-state devices with the exception of the cathode ray tube (CRT).

(4) Each monitor shall be constructed to provide rigid support for electrical systems so that unintentional changes in alignment or microphonic effects will not occur during operation or movement.

(5) Circuit design shall incorporate safety margins of not less than 25 percent where possible, with respect to power dissipation ratings, voltage ratings, and current carrying capacity.

(6) Provide monitors, LCD's or Plasma Displays with a diagonal viewing angle that nominally measures 42 inches.

(7) Provide adequate safeguards to protect personnel from exposure to high voltage during operation or adjustment.

(8) Front panel controls shall include a monitor power switch, horizontal hold, vertical hold, height, contrast, brightness, and focus.

(9) Monitors shall have the following minimum essential requirements:

(a) Resolution: Horizontal resolution for CRT monitors shall not be less than the following: 9 inch monitors - 350 lines; 14 inch monitors - 750 lines;15 inch monitors - 750 lines; 17 inch monitors - 700 lines; 20 inch monitors - 500 lines.

Horizontal resolution for TFT LCD Monitors shall not be less than the following: 10.4 inch monitors - 640 lines; 12.1 inch, monitors - 800 lines; 15 inch monitors - 1024 lines; 17 inch monitors - 1280 lines; 20.1 inch monitors - 800 lines.

(b) Geometry: No point in the active raster shall deviate from its correct position by more than 2 percent of raster height.

b. Mounting and identification

(1) Mount the monitor and other devices subject to burnout or short operating life to facilitate easy replacement.

(2) Label the printed circuit board's function and provide component numbers or markings.

(3) To maintain a standard quality and reliability, components shall be conservatively rated.

(4) Mount TV monitors in a frame for mounting in a 19 inch rack or desk top console.

(5) One 21 inch diagonal TV monitors shall be dually mounted in the console. Protect monitors from circuit overloads by fuse or fuses in the power source line. Power source line fuses shall be mounted in finger-operated extractor fuseposts. Fuseholders shall be located in a readily accessible position.

c. Video and signal input

(1) Monitors shall operate with video input requiring a one Vp-p nominal composite video signal switchable to either loop-through or internal 75-ohm terminating impedance.

(2) Signal input shall be BNC connectors.

2.4.15.6 Ancillary Equipment

Equipment shall consist of the items specified below.

a. Video date/time generator: The video time/date shall originate from either the camera, switcher, video, digital video recorder (DVR) or the video matrix switcher.

b. Camera identifiers: Video signal from each camera shall be identified by alpha numeric identifiers. Camera alpha numeric identifiers may originate from either the camera, switcher, digital video recorder or Video Matrix Switcher.

c. Digital Video Recorder (DVR): The DVR shall provide 9video channels. The DVR will record all cameras onto a hard drive and shall allow remote network viewing via intranet browser. Hard drive capability shall be sized to store all cameras recording 24/7 at 3 images per second per camera for 4 weeks. DVR performance shall be as follows:

(1) The DVR shall use modular hard disk media, with a digital format capacity of 160GB per module.

(2) Include a 9 channel triplex video multiplexer capable of performing encoding, recording and multiscreen viewing modes simultaneously. Provide 9 channels of live, simultaneous video images in which all 16 channels are refreshed at 60 frames per second.

(3) Furnish 10-100base-T connection for record review and camera view and control on a PC workstation equipped with Microsoft Windows XP Professional operating system software, Microsoft Internet Explorer version 6 or greater Internet Browser Software.

(4) PC workstation Viewing: Each of the ESS PC workstations shall include direct access to each DVR via a Microsoft Internet Explorer Web Browser. All necessary descriptive bookmarks and shortcuts shall be prepared on each PC workstation to allow this direct access. All functions shall be accessible through html commands from a user's web browser interface. Pictures shall be available for attachment via a user-provided SMTP-based email transport system, and included capability for 16 users and 3 user access levels (admin, control and user).

(5) Include 720(H) by 480(V) (Pixel Memory) sampling and 3-D scan conversion to enable jitter-free stabilized pictures in a single frame. Include 720(H) by 240(V) and 320(H) by 240(V) (Pixel Memory) sampling, with 120 Images per second system recording rate. Include Emergency, Event, Schedule and Manual Recording Modes.

(6) Each camera shall support individual Recording Rate and Image Quality settings for each of Emergency, Event, Schedule and Manual Recording Modes. This array of Camera Recording Rate and Image Quality settings by the Recording Modes shall form one of 4 Program Actions. The Program Action shall be assignable to a Time Table to form one of 16 Independent Recording Profiles. Each Recording Profile shall be able to be manually activated, activated via RS-232C interface, automatically activated by Time Table, or activated by separate alarm or emergency inputs.

(7) Furnish digital display on the monitor and also recording of the following information: year, month, day, hour, minute and second, as well as alphanumeric camera location ID up to 8 characters. In addition to monitor display, the date and time shall be recorded on the hard disk. The digital video recorder shall also feature video loss detection on all channels.

(8) Pre-event recording: For all individual camera channels, up to 20 seconds of pre-event pictures shall be buffered simultaneously.

(9) Motion-based Recording: Advanced integrated VMD shall be used to detect a specific area, direction and duration of motion for each camera channel, independently and simultaneously. Motion Search may be executed for a single camera channel for a selected area on the image.

(10) Disk Partitioning: Furnish automated disk management and a RTOS (real-time operating system) platform to include up to 4.8 TB of digital video storage on a single partition within the DVR. The DVR System shall provide a choice of Physical Partitioning as RAID5 or Disk Mirroring redundant array recording. The operator shall be able to partition the available recording areas in a Virtual Partition by Regular, Event, and Copy Partitions. Manually and Scheduled recorded video information shall be assigned to a Regular Recording Partition, which may be overwritten. Event and Emergency Recording Data shall be assignable to an Event Partition, where image overwriting shall be prohibited. Any copied data shall be able to be assigned to the Copy Partition, which may be overwritten or saved as required.

(11) Permit direct camera selection for recording playback of any of 9 video sources at the same time as multiscreen viewing and multiplexed camera encoding (triplex multiplexer capability).

(12) Multiplexer Functions: Built-in programmable switcher with dwell time and camera order programming. The unit shall automatically switch multiple camera images to enable sequential spot monitoring and simultaneous field recording. Separate spot, multiscreen, multiscreen/RGB and cascaded video monitor outputs. The unit shall offer full screen, 4, 7, 9, 10, 13 and 16 multiscreen monitoring modes.

(13) Camera Control: Camera functions and control shall be accessible for all cameras. The multiplexer shall furnish access to all camera control, set-up and alarm functions, including preset sequence, digital motion detector mask set, and back light compensation set-up. Controllable camera functions shall be accessible via front panel controls or the optional system controller. These functions shall include direct access of preset position, zoom (near/far), focus (near/far), iris (open/close) and pan (left/right). Camera functions and control shall be accessible for all cameras through the use of the optional control unit. These functions shall include direct access of preset position, zoom (near/far), focus (near/far), iris (open/close) and pan (left/right).

(14) Outputs: Furnish 9 looping outputs for connection of all video sources to external monitoring systems including multiscreen and

spot monitor video outputs, via BNC female connections. Furnish 4 channels of audio connection, including audio loop through via RCA phono jacks. Furnish 1 External Storage connection via High Speed (480 Mbps) Serial Interface. Furnish One 1 External Copy connection via High Speed (480 Mbps) Serial Interface. Furnish 2 independent Video Outputs assignable to Multiscreen or Spot functions (both/either). Furnish one 1 Cascade output for connecting 3 additional digital video recorder for centralized control using a single video monitor. Furnish virtual camera number programming capability to support 64 camera channels on a single system. Furnish 1 independent RGB Video output, capable of monitoring all DVR functions.

(15) Indicators: Furnish Alarm, Alarm Suspend, Operate, HDD1, Hard drive identifier, Timer and Error indicators. Furnish Camera Selection, Iris, Preset and Camera Automatic Mode, Pan/Tilt, Set, Jog Dial, Shuttle Dial, Setup/Esc, Record, Search, Play/Pause, Pan/Tilt Slow, Stop, Pan/Tilt Go to Last, Zoom/Focus, A-B, Repeat, Shift, Alarm Reset Buttons. All Camera selection buttons shall have Tri-State Indication, corresponding to Recording, Viewing and Control functions on actual DVR hardware. PC emulation shall not be an acceptable alternative.

(16) Networking: All DVR recording, review, playback, camera control and setup shall be available via the internally mounted Network Interface. Equip with 10-100base-T connection for record review and camera view and control on a personal computer equipped with Internet Browser Software and an Ethernet 100Base-T connection. Feature shall permit direct camera selection for recording playback of any of 9 video sources at the same time as multiscreen viewing and multiplexed camera encoding (triplex multiplexer mode). Up to eight 8 simultaneous clients viewing and 2 simultaneous FTP sessions shall be supported.

(17) Power: The DVR shall have a power source of 120VAC (50/60 Hz).

e. Four quadrant multiplexer: Unit shall digitally capture full video from four unsynchronized sources and reduce these images to quarter screen size and combine images to provide a real time video output for display of the four inputs in four quadrants of a single monitor.

(1) Video performance requirements shall be as follows:

(a) Input level: One Vp-p nominal into 75 ohms from a 525 line, 60 fields per second source;

(b) Output level: One Vp-p nominal into 75 ohms;

(c) Alarm inputs: Four, rear panel mounted;

(d) Alarm outputs: Relay contacts, rear panel mounted;

(e) Video inputs: Four, looping;

(f) Switching: Five position, front panel mounted;

(g) Memory: 512 by 512 pixels, minimum, digital; and

(h) Gray scale: 64-level.

2.4.16 Security Command Center (SCC)

The Security Command Center shall integrate all sub systems and communications from and provide operator control interface to ESS. Major components shall be as follows:

a. ESS Software

b. Digital Receiver

c. Monitoring Display Software

2.4.16.1 ESS Software

The ESS software shall utilize a single database for the integration of all sub systems. The integration shall be provided under one operating environment. The System shall archive all events in a database stored either on a local hard drive or a networked database server. The software shall support configuration and simultaneous monitoring of all sub systems.

The software shall allow the configuration of networked PC workstations. The PC workstations and file server shall be connected via a TCP/IP network. Administrative tasks such as configuration, monitoring, schedules, report generation shall be provided from any PC workstation on the network. All system programming data shall reside on the single database and shall be instantly accessible to every PC Workstation connected to the network. The system shall utilize a non-proprietary SQL-based, ODBC-compliant database, managed by Sybase Adaptive Server Anywhere, Microsoft SQL Server, or Oracle.

The ESS shall utilize a preemptive multi-tasking operating system: Microsoft Windows 2000, 2003 or Windows XP Professional environment. The System shall be designed to utilize the capabilities of multitasking operation, with many processes running at the same time without interference with each other and with higher priority tasks taking precedence over lower priority tasks.

The ESS software shall support responses to alarms entering the system. Each alarm shall be capable of initiating one or more of the following actions: sending alarm commands to a CCTV system interface, triggering DVR event recording, activating output devices, playing PC audio files, controlling doors, and displaying floor-plan graphical maps associated with the alarm device. The system shall provide mode of system operation that requires operator acknowledgment of any alarm.

The ESS software shall be capable of, but not limited to, the following programming and functionality:

a. Daylight Savings Time Adjustment: There shall be a software-configurable, user defined adjustment for Daylight Savings Time. The ACU(s) and PCU(s) shall not need to be connected to the ESS in order for the adjustment to occur.

b. Operator Privileges: An unlimited number of system operators shall be supported, each with a unique login and password combination. Operators shall be assigned privileges based on the loops, commands, or programming features that are available to each individual operator.

c. Alarm Priorities: Each alarm device shall have the ability to be user configured to belong to one of 10,000 priority levels. Priority levels are numbers assigned to an alarm based on the importance of the alarm. 9,999 is the highest and most critical level of alarms. 0 is the least significant. These priorities shall define which alarm events to display on individually specified ESS workstations.

d. Reports: The ESS shall include integrated reporting capabilities as well as the ability to run Crystal Report templates.

e. User Interface: The ESS programming shall be menu-driven, with "wizards" to assist with software configuration, and shall include on-line 'Help' information.

f. Messages: The ESS shall permit the use of user-selected colors for event messages.

g. Graphics: The ESS shall be capable of displaying a floor-plan graphic for card activity and alarm events as part of the ESS integration.

h. Device Status: The ESS shall be capable of displaying the dynamic status of a user-selected list of devices, including doors, inputs, and outputs.

i. Diagnostics: The ESS shall include diagnostic software tools that interface and query the hardware for information and to issue commands.

j. Mandatory Data Fields: The ESS shall require any cardholder data field to be selected by the user as mandatory. Mandatory data fields are to force ESS operators to input data that is required for proper system configuration.

k. User Defined Data Fields: The ESS shall provide 20 unassigned data fields for storing user-defined data. The data fields shall support user-defined labels, and shall be user-configurable as plain text fields or drop-down selection lists.

l. Archive Database: The ESS shall include a connection to an archive database, which stores purged events and deleted programming, and which can be accessed for reporting.

m. Programmable Database Backup: The ESS shall include the capability of performing user-scheduled database backups, without the use of third-party backup software.

n. Programmable Database Purging: The ESS shall include the capability of performing user-scheduled database purging, moving selected events to an archive database when the events have aged a user-specified number of days.

o. Database Importing: The ESS shall include the capacity to import user data from an ODBC datasource (Access, Excel, text).

p. Data Exporting: The ESS shall include the capacity to export data from any table in the database to either a text or HTML file, in any user-selected order.

q. Event Log Output: The ESS shall include the capacity to send a continuous stream of user-selected types of event messages to a text

file, serial port, or TCP/IP address.

r. Data Audit Trail: The ESS shall record changes to programming, recording the date/time stamp of the change, the name of the operator making the change, and the nature of the change. This data audit shall be available in history for reporting.

2.4.16.2 Digital Receiver

The digital receiver system shall be capable of monitoring PCU digital dialers, data networks and TCP/IP network communications of IDS account zones on the same receiver. The digital receiver enclosure shall house the processor card rack, modem rack, data rack and convenience panel. Built into the front of the digital receiver enclosure shall be an LCD display for viewing incoming reports with a keypad for acknowledging reports and configuring the system and its components. The digital receiver enclosure shall contain internal cards consisting of a processor board, 3 line cards, modem power supply card, multibus power supply card, and transformer card.

The digital receiver shall be capable of, but not limited to, the following programming and functionality:

a. The digital receiver shall provide SCC with computerized monitoring of PCU communication format of Synchronous Data Link Control (SDLC). Digital receiver features shall include automatic logging of alarm, trouble, and supervisory account reports on a local printer with date and time of their occurrence. Capacity of up to 65,535 digital dialer or direct dedicated account zones for alarm, trouble, user and system reports.

b. The Digital receiver shall provide SCC with computerized monitoring of PCU communication format of Host asynchronous (HOST). Digital receiver features shall include automatic logging of alarm, trouble, and supervisory account reports on a local printer with date and time of their occurrence. Capacity for alarm, trouble, user and system reports up to 65,535 host account zones that do not check in and 2,500 accounts that do check in.

c. LCD Display and Keypad: The LCD display shall allow the SCC operator to view alarm reports before acknowledging the alarms using the system keypad. The LCD and keypad shall be built-in to the front of the digital receiver enclosure. The LCD and Keypad are used as a backup when the ESS is not available during maintenance or unplanned system outages.

d. Printer: Routine reports shall be logged on an optional printer without need of operator response. Supervisory and alarm reports shall be logged on the printer and displayed on the LCD for operator acknowledgement. Report capability shall be the over all role of the ESS.

(1) Additional Reports: Receiver shall be able to process additional reports transmitted to it by PCU(s):

(a) Addition and deletion of code numbers including user number of the person making the change.

(b) Bypassing and resetting of zones by number and name including the user number of the person making the change.

(c) Schedule changes including user number of the person making the change.

(d) Trouble and Restoral report by zone name and number.

(e) Door access reports including user number and number of the door being accessed.

e. Communication and Line Capacity:

(1) The digital receiver shall be capable of communication using the IBM Synchronous Data Link Control format.

(2) The digital receiver shall accommodate up to 5 incoming lines.

(3) Digital receiver shall have the ability to be configured with PCU(s) digital dialer, data network and TCP/IP network communication receiving lines.

(4) PCU(s) digital dialer lines shall have a capacity of 65,535 separate accounts.

(5) Data TCP/IP network lines shall have a capacity of 65,535 separate accounts that do not check in or 2,500 separate accounts that do check in.

f. Digital Receiver Enclosure:

(1) Digital receiver enclosure shall provide housing for the processor, power supply, line cards, and associated cables. The enclosure shall measure 8.75 inches high, 19 inches wide and 12 inches deep.
(2) Contained in the top of the system enclosure is the modem rack. The rack shall hold the modem power supply card and up to 5 line cards. The transformer card for connecting the 120 VAC shall be mounted on the rear of the rack modem.
(3) Contained in the bottom of the system enclosure is the multibus rack with cooling fan. The multibus rack holds the processor card and the multibus power supply card.

g. Processor Card: The main system processor shall control the line cards, the LCD display, the built-in keypad, and the printer. The processor shall contain the firmware for system operation, the EEPROM memory of operator codes, line configuration, and perform all time keeping functions.

h. Line Card:

(1) Line card shall provide for 1 incoming line of PCU digital dialer, data network or TCP/IP network communication to PCU(s). Each line card shall have one 10-position flat cable for connection to the processor card and one connector for a phone line or data network line from an RJ11X connection block.

(2) When the line card is configured for PCU digital dialer operation, the line card shall monitor the incoming phone line voltage. During a loss of phone line voltage, a red Phone Line Fail LED shall light and an alert sound. The alert shall be silenced by

pressing the silence switch on the card or software control from ESS. The LED shall remain lit until the phone line is restored.

(3) Line card shall have a green LED labeled PWR to be lit when the power supply on the line card is in a good condition.

(4) Line card shall have six yellow LEDs indicating the condition of the line card during various stages of communication. Stages indicated shall be: Transmit Data, Receive Data, Carrier Detect, On Line, Ring Detect, and Data Terminal Ready.

(5) A Network Interface Card (NIC) shall be integral to the digital receiver with a built in TCP/IP network router. External network routers are not acceptable for Ethernet and Internet/Intranet monitoring.

(6) A Network Interface Card (NIC) shall be integral to the receiver with built in network router capable of 128 Bit AES Rijndael Encryption process certified by NIST (National Institute of Standards and Technology).

i. Modem Power Supply Card:

(1) Modem power supply card shall provide power for up to 5 line cards. Power shall be supplied through the modem rack backplane connectors without additional cabling. The modem power supply card shall also provide monitoring for the LCD connection, UPS system status and 120 VAC input to the digital receiver.

(2) Modem power supply card shall have a green LED labeled PWR. The PWR LED will light when the power supply to the modem power supply card is in good condition. There shall also be a red LED labeled PWR TRBL, which will light when there is a power problem on the modem power supply card along with sounding an alert. The alert shall be able to be silenced by pressing a silence switch on the modem power supply card or software control from ESS. The red LED shall remain lit until power problem is corrected.

(3) Modem power supply card shall have a trouble LED for the LCD that lights and sounds an alert when the LCD is unplugged. The alert shall be able to be silenced by pressing a silence button on the modem power supply card or software control form ESS.

(4) Modem power supply card shall have a trouble LED for the UPS that lights and sounds an alert when the UPS Brownout input is opened. The alert shall be able to be silenced by pressing a silence button on the modem power supply card or software control form ESS.

(5) Modem power supply card shall have a trouble LED for the AC power to the transformer card that lights and sounds an alert when the AC power to the transformer card fails. The alert shall be able to be silenced by pressing a silence button on the modem power supply card or software control form ESS.

j. Special Applications Features: Receiver shall be able to act as a communications path to panels for "Trapping" of PCU(s) for Remote Programming/Interrogation processes. Receiver shall work in conjunction with the ESS in pass thru configuration with an Automation System to "Trap" a PCU and send notification for the panel to contact the remote

link Programming Software for remote interrogation in a Network Application. (TCP/IP Network Trapping).

k. Multibus Power Supply Card

(1) Multibus power supply card shall provide power to the processor card through the multibus backplane. It also shall be able to monitor the condition of the processor card, the voltage output of the modem power supply card and its own internal voltages.

(2) Multibus power supply card shall monitor the processor through the multibus backplane. There shall be a green OK LED that will light when the processor is operating normally. If the processor stops operating, the red FAIL LED will light and failure buzzer shall sound. The system shall restart after the restart button on the multibus power supply card is pressed. System restart button shall not change system configuration.

(3) Multibus power supply card shall monitor three different system voltages, +5, +12, -12 and the modem power supply. Four LEDs shall be located on the multibus power supply card to display any voltage failures.

l. Transformer Card: Transformer card shall provide power to the modem power supply card and the multibus power supply card. It shall also have a power cord for connecting to the multibus rack-cooling fan.

m. Power Cable: Power cable shall be 2 feet long and connect the different system voltages the transformer card and the multibus power supply card.

n. Convenience Panel: Convenience panel shall provide cabling for 2 RS-232 ports. The ports shall be for the host output, activity log printer(s) and auxiliary communications.

o. Printer and Cable:

(1) Printer shall be an 80-column serial printer with a 10-foot RS-232 cable. The printer can be connected to the all events output connector or the alarm only output connector.

(2) Printer shall be configured to 1200 baud, 8 data bits, 1 stop bit and even parity.

p. LCD Display and Keypad

(1) LCD display shall be a 32-character LCD display with a keypad for entry of information and acknowledgment of alarm signals.

(2) LCD display shall be built-in to the front of the system enclosure.

(3) Power shall be provided from the multibus power supply card.

2.4.16.3 Printer Requirements

a. Report Printer: A laser text printer shall be provided for the purpose of generating reports. The printer shall be a parallel or USB interface dry-type laser process printer. The unit shall print a

minimum of 8 pages per minute at 600 dpi resolution.

2.4.16.4 ESS Monitor Display Software

ESS Monitor display software shall provide for text and graphics map displays that include zone and device status integrated into the display. Different colors shall be used for the various components and real time data. Colors shall be uniform on all displays. The following color coding shall be followed.

a. FLASHING RED to alert an operator that a zone has gone into an alarm or that primary power has failed.

b. RED to alert an operator that a zone is in alarm and that the alarm has been acknowledged.

c. YELLOW to advise an operator that a zone is in access.

d. GREEN to indicate that a zone is secure or that power is on.

2.4.16.5 Control and Display Integration

Accomplish so that SCC controls are human engineered as specified in paragraph entitled "Human Engineering" so the entire SCC can be operated by a single or multiple operator(s). In addition, switching and monitoring components of the assessment subsystem shall also be integrated with the SCC so that SCC operator(s) can effectively monitor, assess alarms and control the ESS. Method of system integration shall be as a single console. Provide chassis, and modules required for console configuration of SCC.

2.5 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic,3 mm (0.125 inch) 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 25 by 65 mm (one by 2.5 inches) one by 2.5 inches. Lettering shall be a minimum of 6.35 mm (0.25 inch) 0.25 inch high normal block style.

2.5.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.6 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

UL 681, UL 1037, and UL 1076, and the appropriate installation manual for each equipment type. Components within the system shall be configured with appropriate "service points" to pinpoint system trouble in less than 20 minutes.

3.1.1 Cable and Wire Runs

NFPA 70 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, and as specified herein. Conduits including flexible metal and armored cable shall terminate in the sensor or device enclosure. Ends of conduit shall be fitted with insulated bushings. Exposed conductors at ends of conduits external to sensors and devices are not acceptable.

3.1.2 Soldering

ASTM B32. For soldering electrical connections, use composition Sn60, Type AR or S, for general purposes; use composition Sn62 or Sn63, Type AR or S, for special purposes. When Type S solder is used for soldering electrical connections, flux shall conform to ASTM B32.

3.1.3 Galvanizing

Ferrous metal shall be hot-dip galvanized in accordance with ASTM A123/A123M. Screws, bolts, nuts, and other fastenings and supports shall be corrosion resistant.

3.1.4 Fungus Treatment

Completely treat system components for fungus resistance. Do not use treated materials containing mercury-bearing fungicide. Treating materials shall not increase flammability of material or surface being treated. Treating materials shall not cause skin irritation or other personnel injury during fabrication, transportation, operation, or maintenance of equipment, or during use of finished items when used for the purpose intended.

3.1.5 Conduit

Install in accordance with NFPA 70 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.1.6 Underground Cable Installation

Underground conductors connecting protected structures and objects to the central alarm updating and display unit shall be run direct burial or in conduit as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Coaxial cable shall not be spliced. If permitted, cables connecting protected structures and objects to the security control console shall be sized such that initially only approximately 60 percent of the circuit pairs will be used. Cable pairs not used shall be reserved for future use of additional detection circuits.

3.2 ADJUSTMENT, ALIGNMENT, SYNCHRONIZATION, AND CLEANING

Subsequent to installation, clean each system component of dust, dirt,

grease, or oil incurred during installation or accrued subsequent to installation from other project activities, and prepared for system activation by manufacturer's recommended procedures for adjustment, alignment, or synchronization. Prepare each component in accordance with appropriate provisions of component installation, operations, and maintenance manuals. Remove large vegetation that may sway in the wind and touch fencing.

3.3 ESS System Acceptance and Training

3.3.1 ESS System Acceptance Test

ESS System Acceptance testing shall be performed as follows;

a. The NAVFAC and NAVFAC Engineer will conduct final acceptance testing of the system.

b. Prior to the final acceptance test, security contractor shall conduct a complete test of the entire ESS including subsystems and provide the NAVFAC and NAVFAC Engineer with a written report.

c. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test, intent of the burn-in test shall be to prove the ESS by placing it in near real operating conditions. During this period the ESS shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.

d. Deliver a report describing the results of the functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the NAVFAC and NAVFAC Engineer that the installed complete ESS has been calibrated, tested, and is fully functional as specified herein.

e. Prior to the final acceptance test, complete all clean-up and patch work requirements. Security equipment closets and similar areas shall be free of accumulation of waste materials or rubbish caused by operations under the Contract At completion of the Work, remove all waste materials, rubbish, contractor tools, construction equipment, machinery and all surplus materials.

f. Upon written notification from the Contractor that the ESS is completely installed, integrated and operational, and the burn-in testing completed, the NAVFAC and NAVFAC Engineer will conduct a final acceptance test of the entire system at a mutually acceptable time.

g. During the final acceptance test, no adjustments, repairs or modifications to the system shall be conducted without the permission of the NAVFAC.

h. During the course of the final acceptance test by the NAVFAC and NAVFAC Engineer, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated ESS complies with the contract requirements. Physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing as-built drawings conditions of the ESS to requirements

outlined in this Section, item by item. Following the Section compliance review, ESS and SCCd equipment will be evaluated.

i. The functionality of the various interfaces between systems will be tested.

j. The installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installation, complete functionality of each device, and compliance with mounting, back box and conduit requirements.

k. All equipment shall be on and fully operational during any and all testing procedures. Provide personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two Contractor employees familiar with the ESS for the final acceptance test. One contractor employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two radios or portable telephones for use during the test.

l. The NAVFAC and NAVFAC Engineer retain the right to suspend, terminate or reschedule testing at any time when the ESS is found to be incomplete or fails to perform as specified. In the event that it becomes necessary to suspend, terminate or reschedule the test, all of the NAVFAC and NAVFAC Engineers fees and expenses related to the test shall be deducted from the Contractor's retainage. In the event it becomes necessary to suspend, terminate or reschedule the test, the Contractor shall work diligently to complete and/or repair all outstanding items as required by the Contract Documents. The Contractor shall supply the NAVFAC and NAVFAC Engineer with a detailed punch list completion schedule outlining task-by-task completion dates and a tentative date for a subsequent retest. During the final acceptance test, no adjustments, repairs or modifications to the system shall be conducted without the permission of the NAVFAC Engineer and NAVFAC.

3.3.2 ESS Training Outline

Provide training as coordinated with the NAVFAC. The following training program is intended to identify typical training requirements and may be modified and/or amended to meet specific NAVFAC training requirements.

3.3.2.1 ESS Administrator Training

a. ACS Administrator Training shall include:

(1) Two eight-hour on-site training sessions.
(2) Operating system procedures and configuration.
(3) Operator functions.
(4) Database functions and setup.
(5) Cardholder input and deletion procedures.
(6) Report generation.
(7) Applications programs (as applicable).

(8) Items unique to the ACS interfaces with other systems

b. CCTV System Administrator Training shall include:

(1) One eight-hour session on site.

(2) Training shall include all administrator and operator functions, and items unique to the installed CCTV System and the interfaces with other systems.

3.3.2.2 ESS Operator Training

Coordinate the operator training syllabus with NAVFAC prior to conducting operator training.

a. ACS Operator Training shall include:

(1) One (one-day) 8 hours on-site training sessions.
(2) System operating procedures.
(3) System configuration orientation.
(4) Alarm acknowledgment.
(5) Alarm response logging.
(5) Items unique to the ACS interfaces with other systems.

b. CCTV Operator Training shall include:

(1) One (one-day) 8 on-site training sessions.
(2) Training shall include:
(3) Operating procedures.
(4) System configuration.
(5) Video call-up.
(6) Camera and monitor control.
(7) Basic device terminology and troubleshooting.

3.3.3 Follow-up Training

a. One, two hour training session each month for one month after initial training.

b. Follow-up training shall begin one month after initial training.

c. Training shall include testing for system competence.

3.3.4 Training Operating and Maintenance Personnel

Furnish instruction for operating staff in system operation and operator troubleshooting and preventive maintenance procedures. Instruction shall consist of 2 man-days, 8 hours per day, and shall be held during normal duty hours. Commence instruction after system is fully operational, and complete instruction prior to system acceptance and turnover to the Government. Attendance at equipment manufacturer's recommended maintenance training schools may be substituted for this training. Costs associated with such schooling, less travel and per diem, shall be borne by the Contractor. Complete maintenance instruction prior to system acceptance and turnover to the Government.

3.4 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.5 NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two

sheet-metal screws or two rivets.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL
02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D 1140	(2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(2010) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(2010) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D 698	(2007e1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004	(1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698, for general soil types, abbreviated as percent laboratory maximum density.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring and Sheeting Plan

Dewatering work plan

SD-06 Test Reports

Borrow Site Testing; G

Fill and backfill test; G

Select material test; G

Density tests; G

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 REQUIREMENTS FOR OFF SITE SOIL

Soils brought in from off site for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA 530/F-93/004 Method 5030/8020. TCLP shall be performed in accordance with EPA 530/F-93/004 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Contracting Officer.

1.6 QUALITY ASSURANCE

1.6.1 Shoring and Sheeting Plan

Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations.

Drawings shall include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations shall include data and references used.

The Contractor is required to hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer shall update the excavation, sheeting and dewatering plans as construction progresses to reflect changing conditions and shall submit an updated plan if necessary. A written report shall be submitted, at least monthly, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Geotechnical Engineer shall be available to meet with the Contracting Officer at any time throughout the contract duration.

1.6.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.6.3 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, or SP-SM,, free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 6 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.4 Backfill and Fill Material

ASTM D 2487, classification GW, GP, GM, SW, SP, SM, with a maximum ASTM D 4318 liquid limit of 35, maximum ASTM D 4318 plasticity index of 12, and a maximum of 20 percent by weight passing ASTM D 1140, No. 200 sieve.

2.1.5 Select Material

Provide materials classified as GW, GP, SW, or SP by ASTM D 2487 where indicated.

2.1.6 Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

2.2 UTILITY BEDDING AND UTILITY BACKFILL MATERIAL

2.2.1 Sand

Clean, coarse-grained sand meeting the requirements of the VDOT Road & Bridge Specifications, latest edition, Section 202, for "Fine Aggregates."

2.2.2 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof meeting the requirements of the VDOT Road & Bridge Specifications, latest edition, Section 203 for "Coarse Aggregates," sizes 57, 67, or 78, unless otherwise noted on the plans.

2.3 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of Government property.

2.4 BACKFILL FOR UNDERDRAINAGE SYSTEMS

Clean sand, crushed rock, or gravel meeting the requirements of the VDOT Road & Bridge Specifications, latest edition, Section 203 for "Coarse Aggregates," size 57, unless otherwise noted on the plans.

2.5 GEOTEXTILE/FILTER FABRIC

Geotextile and filter fabric material shall meet the requirements of the VDOT Road & Bridge Specifications, latest edition, Section 245, for "Geotextile for Use in Drainage Systems", unless otherwise noted on the plans.

2.6 MATERIAL FOR RIP-RAP

Riprap material shall meet the requirements of the VDOT Road & Bridge Specifications, latest edition, Sections 204 and 414, Class AI , unless

otherwise noted on the plans.

2.7 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Red:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems

2.7.1 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring, bracing, cribbing, trench boxes, underpinning or sheeting as required. In addition to Section 25 A and B of EM 385-1-1 and other requirements set forth in this contract, include provisions in the shoring and sheeting plan that will accomplish the following:

a. Prevent undermining of pavements, foundations and slabs.

b. Prevent slippage or movement in banks or slopes adjacent to the excavation.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and

throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, dikes, swales, and other drainage features and equipment as required to maintain dry soils, prevent erosion and undermining of foundations. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously below the working level.

3.1.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the construction site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

3.1.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the clearing limits. Remove stumps entirely. Grub out matted roots and roots over 2 inches in diameter to at least 18 inches below existing surface.

3.2.2 Stripping

Strip topsoil from the site at least 5' beyond the perimeter limits of roadways, walks and structures and stockpile separately from other

excavated material. Material unsuitable for use as topsoil shall be wasted. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.2.3 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed and backfilled as directed by the Contracting Officer. . Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for paved areas, buildings and spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.3.1 Structures With Spread Footings

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Fill over excavations with concrete during foundation placement.

3.3.2 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

3.3.3 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3.4 Final Grade of Surfaces to Support Concrete

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level

surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified herein.

3.4.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the building and roads with six passes of a dump truck loaded with 212 cubic feet of soil. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 miles per hour. When proof rolling under buildings, the building subgrade shall be considered to extend 5 feet beyond the building lines, and one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut and backfilled as directed by the Contracting Officer.

3.5 SUBGRADE GEOTEXTILE/FILTER FABRIC

Place synthetic fiber filter fabric as indicated directly on prepared subgrade free of vegetation, stumps, rocks larger than 2 inches diameter and other debris which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of 3 feet overlap in all directions. Overlap fabric at joints a minimum of 3 feet. Obtain approval of filter fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturer's recommended installation procedures.

3.6 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.6.1 Common Fill Placement

Provide for general site. Use satisfactory materials. Place in 6 inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.6.2 Backfill and Fill Material Placement

Provide for paved and other roadway areas and under concrete slabs, except where select material is provided. Place in 6 inch lifts. Do not place over wet or frozen areas. Place backfill material adjacent to structures as the structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against the structure.

3.6.3 Select Material Placement

Provide under porous fill of structures not pile supported. Place in 6 inch lifts. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.6.4 Backfill and Fill Material Placement Over Pipes and at Walls

Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

3.6.5 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Install utility backfill material around the utility line as shown on the plans. Place and compact backfill under structures and paved areas in 6 inch lifts to top of trench and in 6 inch lifts to one foot over pipe outside structures and paved areas.

3.7 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.8 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape

12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.9 COMPACTION

Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required.

3.9.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D 698.

3.9.2 Structures, Spread Footings, and Concrete Slabs

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact fill and backfill material to 95 percent of ASTM D 698.

3.9.3 Paved Areas

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact fill and backfill materials to 95 percent of ASTM D 698.

3.10 SPECIAL EARTHWORK REQUIREMENTS FOR SUBSURFACE DRAINS

Excavate to dimensions indicated. Place special granular filter material in 6 inch lifts and compact with mechanical, vibrating plate tampers or rammers until no further consolidation can be achieved. Compact backfill overlying the special granular filter material as specified for adjacent or overlying work.

3.10.1 Granular Backfill

3.10.1.1 Perforated or Slotted Wall Pipe

Place granular material as pipe is laid and extend fit for a minimum of one pipe diameter on each side of and 6 inches above the top of the pipe, or as shown on the plans.

3.11 RIP-RAP CONSTRUCTION

Construct rip-rap material in accordance with the the requirements of the VDOT Road & Bridge Specifications, latest edition, Sections 414, unless otherwise noted on the plans.

3.12 FINISH OPERATIONS

3.12.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.12.2 Topsoil and Seed

Scarify existing subgrade. Provide 4 inches of topsoil for newly graded finish earth surfaces and areas disturbed by the Contractor. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry,

or in a condition otherwise detrimental to seeding, planting, or proper grading. If there is insufficient on-site topsoil meeting specified requirements for topsoil, provide topsoil required in excess of that available.

Provide mulch, fertilizer, and water to establish an acceptable stand of grass. All seeding and mulching shall meet the requirements of the "Virginia Erosion and Sediment Control Handbook", latest edition, Standard 3.32 "Permanent Seeding" and Standard 3.35 "Mulching" and the approved Erosion and Sediment Control Plan.

3.12.3 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.13 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

3.14 FIELD QUALITY CONTROL

3.14.1 Sampling

Take the number and size of samples required to perform the following tests.

3.14.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.14.2.1 Fill and Backfill Material Testing

Test fill and backfill material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4318 for liquid limit and for plastic limit; ASTM D 698 for moisture density relations, as applicable.

3.14.2.2 Select Material Testing

Test select material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 698 for moisture density relations, as applicable.

3.14.2.3 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 6938. When ASTM D 6938 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 6938 tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 6938 density tests thereafter. Test each lift at randomly selected locations every 2000 square feet of existing grade in fills for structures and concrete slabs, and every 2500 square feet for other fill areas and every 2000 square feet of subgrade in cut. Include density test results in daily report.
Bedding and backfill in trenches: One test per 50 linear feet in each lift.

-- End of Section --

SECTION 32 11 23

AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2010) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2167	(2008) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2010) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Course

Aggregate course is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum dry density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve are expressed as a percentage of the laboratory maximum dry density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224.

1.3 SYSTEM DESCRIPTION

All plant, equipment and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Provide adequate equipment having the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Aggregate Material Certification; G

SD-06 Test Reports

Field Density Tests; G

1.5 QUALITY ASSURANCE

Testing is the responsibility of the Contractor and performed by a testing laboratory approved in accordance with Section 01 45 00.10 20 QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements; perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

1.5.1 Tests

Perform the following tests in conformance with the applicable standards listed.

1.5.1.1 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture content in accordance with ASTM D 1557.

1.5.1.2 Field Density Tests

Measure field density in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 6938.

a. Submit copies of field test results within 24 hours after the tests are performed.

1.5.2 Testing Frequency

1.5.2.1 In Place Tests

Perform each of the following tests on samples taken from the placed and compacted aggregate. Samples shall be taken and tested at the rates indicated.

a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

b. Measure the total thickness of the base course at intervals, in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

PART 2 PRODUCTS

2.1 AGGREGATES

Provide aggrgates consisting of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, angular sand, or other approved material.

2.1.1 Aggregate Base Course

Provide coarse aggregates with angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

Aggregate shall meet the requirements of the VDOT Road & Bridge Specifications, latest edition, Section 208 for "Subbase and Aggregate Base Material," size 21A or 21B. Submit Aggregate Material Certification reflecting compliance with the required specifications.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the Aggregate Course is constructed in more than one layer, clean the previously constructed layer of loose and foreign matter by sweeping with

power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area. Provide line and grade stakes as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 PREPARATION OF UNDERLYING COURSE

Prior to constructing the base course(s), the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction of the base course(s), the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 31 23 00.00 20 EXCAVATION AND FILL. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the base course(s). The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the base course is placed.

3.3 INSTALLATION

3.3.1 Placing

Place the mixed material on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, place the material in a single layer. When a compacted layer in excess of 6 inches is required, place the material in layers of equal thickness. No layer shall be thicker than 6 inches or thinner than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the base course is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable base course.

3.3.2 Grade Control

The finished and completed base course shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required base course thickness so that the finished base course and the subsequent surface course will meet the designated grades.

3.3.3 Compaction

Compact each layer of the base course, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of the optimum water content

determined from laboratory tests as specified in this Section. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Continue compaction until each layer has a degree of compaction that is at least 100 percent of laboratory maximum density through the full depth of the layer. Make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory base course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.3.4 Thickness

Construct the compacted thickness of the base course as indicated. No individual layer shall be thicker than 6 inches nor be thinner than 3 inches in compacted thickness. The total compacted thickness of the base course(s) shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.3.5 Finishing

The surface of the top layer of base course shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of base course is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.3.6 Smoothness

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.4 MAINTENANCE

Maintain the base course in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any base course that is not paved over prior to the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of base course that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.5 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of outside the limits of Government-controlled land. No additional payments will be made for materials that must be replaced.

-- End of Section --

SECTION 32 12 17

HOT MIX BITUMINOUS PAVEMENT
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D1188	(2007; E 2010) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D2726	(2011) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D995	(1995b; R 2002) Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
ASTM D3666	(2011) Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-05 Design Data; G

MIX DESIGN; G

1.3 QUALITY ASSURANCE

1.3.1 Safety Requirements

Provide adequate and safe stairways with handrails to the mixer platform, and safe and protected ladders or other means for accessibility to plant operations. Guard equipment and exposed steam or other high temperature lines or cover with a suitable type of insulation.

1.3.2 Required Data

MIX DESIGN shall show the following:

a. Source and proportions, percent by weight, of each ingredient of the mixture;

b. Correct gradation, the percentages passing each size sieve listed in the specifications for the mixture to be used, for the aggregate and mineral filler from each separate source and from each different size to be used in the mixture and for the composite mixture;

c. Amount of material passing the No. 200 sieve determined by dry sieving;

d. Number of blows of hammer compaction per side of molded specimen;

e. Temperature viscosity relationship of the asphalt cement;

f. Stability, flow, percent voids in mineral aggregate, percent air voids, unit weight;

g. Asphalt absorption by the aggregate;

h. Effective asphalt content as percent by weight of total mix;

i. Temperature of the mixture immediately upon completion of mixing;

j. Asphalt performance grade viscosity grade; and

k. Curves for the binder and wearing courses.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage and store with a minimum of handling. Store aggregates in such a manner as to prevent segregation, contamination, or intermixing of the different aggregate sizes.

1.5 ENVIRONMENTAL CONDITIONS

Place bituminous mixture only during dry weather and on dry surfaces. Place courses only when the surface temperature of the underlying course is greater than 45 degrees F for course thicknesses greater than one inch and 55 degrees F for course thicknesses one inch or less.

1.6 CONSTRUCTION EQUIPMENT

Calibrated equipment, such as scales, batching equipment, spreaders and similar equipment, shall have been recalibrated by a calibration laboratory approved by the Contracting Officer within 12 months of commencing work.

1.6.1 Mixing Plant

Design, coordinate, and operate the mixing plant to produce a mixture within the job-mix formula tolerances and to meet the requirements of ASTM D995, including additional plant requirements specified herein. The plant shall be a batch type, continuous mix type or drum-dryer mixer type, and shall have sufficient capacity to handle the new bituminous construction. Minimum plant capacity shall be 100 tons per hour. The mixing plant and equipment shall remain accessible at all times for inspecting operation, verifying weights, proportions and character of materials, and checking mixture temperatures. The plant and plant site shall meet the requirements of Section 01 57 19.00 20 TEMPORARY

ENVIRONMENTAL CONTROLS.

1.6.2 Paving Equipment

1.6.2.1 Spreading Equipment

Self-propelled electronically controlled type, unless other equipment is authorized by the Contracting Officer. Equip spreading equipment of the self-propelled electronically controlled type with hoppers, tamping or vibrating devices, distributing screws, electronically adjustable screeds, and equalizing devices. Capable of spreading hot bituminous mixtures without tearing, shoving, or gouging and to produce a finished surface of specified grade and smoothness. Operate spreaders, when laying mixture, at variable speeds between 5 and 45 feet per minute. Design spreader with a quick and efficient steering device; a forward and reverse traveling speed; and automatic devices to adjust to grade and confine the edges of the mixture to true lines. The use of a spreader that leaves indented areas or other objectionable irregularities in the fresh laid mix during operations is prohibited.

1.6.2.2 Rolling Equipment

Self-propelled pneumatic-tired rollers supplemented by three-wheel and tandem type steel wheel rollers. The number, type and weight of rollers shall be sufficient to compact the mixture to the required density without detrimentally affecting the compacted material. Rollers shall be suitable for rolling hot-mix bituminous pavements and capable of reversing without backlash. Pneumatic-tired rollers shall be capable of being operated both forward and backward without turning on the mat, and without loosening the surface being rolled. Equip rollers with suitable devices and apparatus to keep the rolling surfaces wet and prevent adherence of bituminous mixture. Vibratory rollers especially designed for bituminous concrete compaction may be used provided rollers do not impair stability of pavement structure and underlying layers. Repair depressions in pavement surfaces resulting from use of vibratory rollers. Rollers shall be self-propelled, single or dual vibrating drums, and steel drive wheels, as applicable; equipped with variable amplitude and separate controls for energy and propulsion.

1.6.2.3 Hand Tampers

Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.

1.6.2.4 Mechanical Hand Tampers

Commercial type, operated by pneumatic pressure or by internal combustion.

PART 2 PRODUCTS

2.1 MIX DESIGN

The following bituminous pavement mixes shall be in accordance with the VDOT Road and Bridge Specifications, latest edition:

Surface Course	SM-9.5A

2.2 SOURCE QUALITY CONTROL

Employ a commercial laboratory approved by the Contracting Officer to

perform testing. The laboratory used to develop the JMF and the laboratory used to perform all sampling and testing shall meet the requirements of ASTM D3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Transportation of Bituminous Mixtures

Transport bituminous material from the mixing plant to the paving site in trucks having tight, clean, smooth beds that have been coated with a minimum amount of concentrated solution of hydrated lime and water or other approved coating to prevent adhesion of the mixture to the truck. Petroleum products will not be permitted for coating truck. If air temperature is less than 60 degrees F or if haul time is greater than 30 minutes, cover each load with canvas or other approved material of ample size to protect the mixture from the loss of heat. Make deliveries so that the spreading and rolling of all the mixture prepared for one day's run can be completed during daylight, unless adequate approved artificial lighting is provided. Deliver mixture to area to be paved so that the temperature at the time of dumping into the spreader is within the range specified herein. Reject loads that are below minimum temperature, that have crusts of cold unworkable material, or that have been wet excessively by rain. Hauling over freshly laid material is prohibited.

3.1.2 Surface Preparation of Underlying Course

Prior to the laying of the asphalt concrete, clean underlying course of foreign or objectionable matter with power blowers or power brooms, supplemented by hand brooms and other cleaning methods where necessary. During the placement of multiple lifts of bituminous concrete, each succeeding lift of bituminous concrete shall have its underlying lift cleaned and provided with a bituminous tack coat if the time period between the placement of each lift of bituminous concrete exceeds 14 days, or the underlying bituminous concrete has become dirty. Remove grass and other vegetative growth from existing cracks and surfaces.

3.2 PLACEMENT

3.2.1 Machine Spreading

The range of temperatures of the mixtures at the time of spreading shall be between 250 degrees F and 300 degrees F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to

follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device of not less than 30 feet in length and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling.

3.2.2 Shoveling, Raking, and Tamping After Machine-Spreading

Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alignment left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

3.2.3 Hand-Spreading in Lieu of Machine-Spreading

In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250 and 300 degrees F. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to the required grade, thickness, and smoothness. During hand spreading, place each shovelful of mixture by turning the shovel over in a manner that will prevent segregation. Do not place mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

3.3 COMPACTION OF MIXTURE

Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least one foot. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture, or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 96 percent but not more than 100 percent of that attained in a laboratory specimen of the same mixture prepared in accordance with ASTM D1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output.

In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

3.4 JOINTS

Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.

3.4.1 Transverse

Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 2 feet.

3.4.2 Longitudinal Joints

Space 6 inches apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 2 to 3 inches and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.

3.5 FIELD QUALITY CONTROL

3.5.1 Testing

3.5.1.1 Pavement Courses

Perform the following tests:

a. Density: For each 1000 tons of bituminous mixture placed, determine the representative laboratory density by averaging the density of four laboratory specimens prepared in accordance with ASTM D1559. Samples for laboratory specimens shall be taken from trucks delivering mixture to the site; record in a manner approved by the Contracting Officer the project areas represented by the laboratory densities. From each representative area recorded, determine field density of pavement by

averaging densities of 4 inch diameter cores obtained from wearing courses; take one core for each 2000 square yards or fraction thereof of course placed. Determine density of laboratory prepared specimens and cored samples in accordance with ASTM D1188 or ASTM D2726, as applicable. Separate pavement layers by sawing or other approved means. Maximum allowable deficiency at any point, excluding joints, shall not be more than 2 percent less than the specified density for any course. The average density of each course, excluding joints, shall be not less than the specified density. Joint densities shall not be more than 2 percent less than specified course densities and are not included when calculating average course densities. When the deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

b. Thickness: Determine thickness of binder and wearing courses from samples taken for the field density test. The maximum allowable deficiency at any point shall not be more than 1/4 inch less than the thickness for the indicated course. Average thickness of course or of combined courses shall be not less than the indicated thickness. Where a deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

c. Smoothness: Straightedge test the compacted surface of the wearing course as work progresses. Apply straightedge parallel with and at right angles to the centerline after final rolling. Unevenness of the wearing course shall not vary more than 1/8 inch in 10 feet. Correct each portion of the pavement showing irregularities greater than that specified.

d. Finished Grades: Finish grades of each course placed shall not vary from the finish elevations, profiles, and cross sections indicated by more than 1/2 inch. Finished surface of the final wearing course will be tested by running lines of levels at intervals of 25 feet longitudinally and transversely to determine elevations of completed pavement. Within 45 days after completion of final placement, perform a level survey at the specified grid spacing and plot the results on a plan drawn to the same scale as the drawings. Elevations not in conformance with the specified tolerance shall be noted on the plan in an approved manner. The survey shall be performed by a registered land surveyor. The Contracting Officer will inform the Contractor in writing of paved areas that fail to meet the final grades indicated within the specified tolerances. Correct deficient paved areas by removing existing work and replacing with new materials that meet the specifications. Skin patching for correcting low areas is prohibited.

e. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or tears, checking, excessive exposure of coarse aggregates, sand streaks, indentations, ripples, or lack of uniformity shall be removed and replaced with new materials.

3.6 PROTECTION

Do not permit vehicular traffic, including heavy equipment, on pavement until surface temperature has cooled to at least 120 degrees F. Measure surface temperature by approved surface thermometers or other satisfactory methods.

-- End of Section --

SECTION 32 16 13

CONCRETE SIDEWALKS AND CURBS AND GUTTERS
04/08

PART 1 GENERAL
1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(2005; R 2009) Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats

ASTM INTERNATIONAL (ASTM)

ASTM A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615/A615M	(2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C 143/C 143M	(2010) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C 171	(2007) Standard Specification for Sheet Materials for Curing Concrete
ASTM C 173/C 173M	(2010b) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 309	(2007) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM C172/C172M	(2010) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231/C231M	(2010) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM D 1751	(2004; R 2008) Standard Specification for

	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(2004a; R 2008) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D5893/D5893M	(2010) Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Provide plant, equipment, machines, and tools used in the work subject to approval and maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Concrete and admixtures; G

Copies of certified delivery tickets for all concrete used in the construction.

SD-05 Design Data

Concrete Design Mix; G

SD-06 Test Reports

Field Quality Control

Copies of all test reports within 24 hours of completion of the test.

1.4 ENVIRONMENTAL REQUIREMENTS

1.4.1 Placing During Cold Weather

Do not place concrete when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Make provisions to protect the concrete from freezing during

the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing. Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.4.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

PART 2 PRODUCTS

2.1 CONCRETE

Provide concrete design mix conforming to the applicable requirements of the Virginia Department of Transportation Road and Bridge Specifications, latest edition, Class A4, unless noted otherwise. Maximum size of aggregate shall be 1-1/2 inches.

2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with ASTM C 143/C 143M.

2.1.3 Reinforcement Steel

Reinforcement bars shall conform to ASTM A615/A615M. Wire mesh reinforcement shall conform to ASTM A185/A185M.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

2.2.3 White Pigmented Membrane-Forming Curing Compound

White pigmented membrane-forming curing compound shall conform to ASTM C 309, Type 2.

2.3 JOINT FILLER STRIPS

2.3.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.3.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 1/2 inch thick, unless otherwise indicated.

2.4 JOINT SEALANTS

Joint sealant, cold-applied shall conform to ASTM C 920 or ASTM D5893/D5893M.

2.5 FORM WORK

Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.5.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

2.5.2 Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted in conformance with Section 31 23 00.00 20 EXCAVATION AND FILL.

3.1.1 Sidewalk Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

3.1.3 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING

Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope as indicated with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any

direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Place concrete in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated by tamping and spading or with an approved vibrator, and the surface shall be finished to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

3.4.3 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing

block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

3.4.4 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.4.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.5.1 Sidewalk Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

3.5.2 Sidewalk Expansion Joints

Expansion joints shall be formed with 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D 1752 or building paper. Joint filler shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with cold-applied joint sealant. Joint sealant shall be gray or stone in color. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete

temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.5.3 Reinforcement Steel Placement

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.

a. Contraction joints (except for slip forming) shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

b. When slip forming is used, the contraction joints shall be cut in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. The depth of cut shall be at least one-fourth of the gutter/curb depth and 1/8 inch in width.

3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not less than 30 feet nor greater than 120 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Expansion joints and the top 1 inch depth of curb and gutter contraction-joints shall be sealed with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet/gallon for the total of both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete

in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Completed concrete shall be protected from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.8 FIELD QUALITY CONTROL

3.8.1 General Requirements

Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

Provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C172/C172M. Cylinders for acceptance shall be molded in conformance with ASTM C 31/C 31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Determine air content in accordance with ASTM C 173/C 173M or ASTM C231/C231M. ASTM C231/C231M shall be used with concretes and mortars

made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

SECTION 32 17 23.00 20

PAVEMENT MARKINGS
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D792	(2008) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM E28	(1999; R 2009) Softening Point of Resins Derived from Naval Stores by Ring and Ball Apparatus

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-1952	(Rev E) Paint, Traffic and Airfield Markings, Waterborne

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Paints for roads and streets; G

Thermoplastic compound; G

Equipment; G

Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

Qualifications; G

Documentation on personnel qualifications, as specified.

SD-07 Certificates

Paints for roads and streets; G

Thermoplastic compound; G

SD-08 Manufacturer's Instructions

Paints for roads and streets

Thermoplastic compound

Submit manufacturer's Material Safety Data Sheets.

1.3 DELIVERY AND STORAGE

Deliver paints, paint materials and thermoplastic compound materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.4 WEATHER LIMITATIONS

Apply paint to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 5 degrees above the dew point and the air and pavement temperatures are above 40 degrees F and less than 95 degrees F for oil-based materials; above 50 degrees F and less than 110 degrees F for water-based materials. Maintain paint temperature within these same limits.

1.5 EQUIPMENT

Machines, tools, and equipment used in the performance of the work shall be approved by the Contracting Officer and maintained in satisfactory operating condition. Submit construction equipment list for approval by the Contracting Officer.

1.5.1 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

1.5.2 Paint Application Equipment

1.5.2.1 Hand-Operated, Push-Type Machines

Provide hand-operated push-type applicator machine of a type commonly used for application of paint to pavement surfaces. Paint applicator machine shall be acceptable for marking small street and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Applicator for water-based markings shall be equipped with non-stick coated hoses; metal parts in contact with the paint material shall be constructed of grade 302, 304, 316, or equal stainless steel.

1.5.2.2 Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines

Provide self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. Provide machine having a speed during application

capable of applying the stripe widths indicated at the paint coverage rate specified herein and of even uniform thickness with clear-cut edges. Provide paint applicator with paint reservoirs or tanks of sufficient capacity and suitable gages to apply paint in accordance with requirements specified. Equip tanks with suitable air-driven mechanical agitators. Equip spray mechanism with quick-action valves conveniently located, and include necessary pressure regulators and gages in full view and reach of the operator. Install paint strainers in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Provide pneumatic spray guns for hand application of paint in areas where the mobile paint applicator cannot be used. Applicator for water-based markings shall be equipped with non-stick coated hoses; metal parts in contact with the paint material shall be constructed of grade 302, 304, 316, or equal stainless steel.

1.5.3 Thermoplastic Application Equipment

1.5.3.1 Thermoplastic Material

Thermoplastic material shall be applied to the primed pavement surface by spray techniques or by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for heating and controlling the flow of material. By either method, the markings shall be applied with equipment that is capable of providing continuous uniformity in the dimensions of the stripe.

1.5.3.2 Application Equipment

a. Application equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe or spray gun shall prevent accumulation and clogging. All parts of the equipment which come into contact with the material shall be easily accessible and exposable for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns shall maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.

b. The application equipment shall be constructed to ensure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off stripe ends squarely and shall provide a method of applying "skiplines". The equipment shall be capable of applying varying widths of traffic markings.

1.5.3.3 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.

1.5.3.4 Mobile Application Equipment

The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by

either the extrusion or spray method. The unit shall be equipped to apply the thermoplastic marking material at temperatures exceeding 375 degrees F, at widths varying from 3 to 12 inches and in thicknesses varying from 0.040 to 0.200 inch and shall have an automatic drop-on bead system. The mobile unit shall be capable of operating continuously and of installing a minimum of 20,000 lineal feet of longitudinal markings in an 8-hour day.

The mobile unit shall be equipped with a melting kettle which holds a minimum of 6000 pounds of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 375 to 425 degrees F. A thermostatically controlled heat transfer liquid shall be used. Heating of the composition by direct flame shall not be allowed. Oil and material temperature gauges shall be visible at both ends of the kettle. The mobile unit shall be equipped with a minimum of two extrusion shoes located one on each side of the truck, and shall be capable of marking simultaneous edgeline and centerline stripes. Each extrusion shoe shall be a closed, oil-jacketed unit; shall hold the molten thermoplastic at a temperature of 375 to 425 degrees F; and shall be capable of extruding a line of 3 to 8 inches in width; and at a thickness of not less than 0.120 inch nor more than 0.190 inch, and of generally uniform cross section.

The mobile unit shall be equipped with an electronic programmable line pattern control system. The control system shall be capable of applying skip or solid lines in any sequence, through any and all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, the mobile unit shall be equipped with an automatic counting mechanism capable of recording the number of lineal feet of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

1.5.3.5 Portable Application Equipment

The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stopbars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. The portable applicator shall be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. The portable applicator shall be equipped with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 375 to 425 degrees F, of extruding a line of 3 to 12 inches in width, and in thickness of not less than 0.120 inch nor more than 0.190 inch and of generally uniform cross section.

1.5.4 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.6 MAINTENANCE OF TRAFFIC

1.6.1 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.7 QUALIFICATIONS

The Contractor shall submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of chemicals.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials conforming to the requirements specified herein.

2.1.1 Paints for Roads and Streets

FS TT-P-1952 , color as indicated.

2.1.2 Thermoplastic Compound

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

2.1.2.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin. The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

Component	Percent by Weight	
	White	Yellow
Binder	17 min	17 min
Titanium dioxide	10 min	-
Glass beads	20 min	20 min
Calcium carbonate and	49 min	*
Yellow pigments	-	*
*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.		

2.1.2.2 Physical Properties

a. Drying time: When installed at 70 degrees F and in thicknesses between 0.120 and 0.190 inch, the composition shall be completely solid and

shall show no damaging effect from traffic after curing 15 minutes.

b. Softening point: The composition shall have a softening point of not less than 194 degrees F when tested in accordance with ASTM E28.

c. Specific gravity: The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D792.

2.1.2.3 Primer

a. Asphalt concrete primer: The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved or dispersed in a volatile organic solvent. The solids content shall not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch, plus or minus 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.

b. Portland cement concrete primer: The primer for portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Do not commence painting in any area until pavement surfaces are dry and clean.

3.1.1 Early Painting of Asphalt Pavements

For asphalt pavement systems requiring painting application at less than 30 days, apply the paint and beads at half the normal application rate, followed by a second application at the normal rate after 30 days.

3.2 APPLICATION

3.2.1 Testing for Moisture

Apply pavement markings to dry pavement only. The Contractor shall test the pavement surface for moisture before beginning work after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the CO or authorized representative. Employ the "plastic wrap method" to test the pavement for moisture as follows: Cover the pavement with a 300 mm by 300 mm (12 inch by 12 inch) section of clear plastic wrap and seal the edges with tape. After 15 minutes, examine the plastic wrap for any visible moisture accumulation inside the plastic. Do not begin marking operations until the test can be performed with no visible moisture accumulation inside the plastic wrap.

3.2.2 Rate of Application

3.2.2.1 Nonreflective Markings

Apply paint evenly to the pavement surface to be coated at a rate of 105 plus or minus 5 square feet per gallon.

3.2.2.2 Thermoplastic Compound

After surface preparation has been completed, prime the asphalt or concrete pavement surface with spray equipment. Allow primer materials to "set-up" prior to applying the thermoplastic composition. Allow the asphalt concrete primer to dry to a tack-free condition, usually occurring in less than 10 minutes. Apply asphalt concrete primer to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch 265 to 400 square feet per gallon. After the primer has "set-up", apply the thermoplastic at temperatures no lower than 375 degrees F nor higher than 425 degrees F at the point of deposition. Apply all extruded thermoplastic markings at the specified width and at a thickness of not less than 0.125 inch nor more than 0.190 inch. Apply all sprayed thermoplastic markings at the specified width and the thickness designated in the contract plans. If the plans do not specify a thickness, apply centerline markings at a wet thickness of 0.090 inch, plus or minus 0.005 inch, and edgeline markings at a wet thickness of 0.060 inch, plus or minus 0.005 inch.

3.2.3 Painting

Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.

3.2.4 Thermoplastic Compound

Place thermoplastic pavement markings upon dry pavement. At the time of installation the pavement surface temperature shall be a minimum of 40 degrees F and rising. Thermoplastics, as placed, shall be free from dirt or tint. Apply all centerline, skipline, edgeline, and other longitudinal type markings with a mobile applicator. Place all special markings, crosswalks, stop bars, legends, arrows, and similar patterns with a portable applicator, using the extrusion method.

3.3 FIELD TESTING, INSPECTION, AND DEMONSTRATIONS

3.3.1 Inspection

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. A certificate of compliance shall be accompanied by test results substantiating conformance to the specified requirements.

3.3.2 Surface Preparations and Application Procedures

Surface preparations and application procedures will be examined by the Contracting Officer to determine conformance with the requirements specified. Approve each separate operation prior to initiation of subsequent operations.

3.3.2.1 Test Stripe Demonstration

Prior to paint application, demonstrate test stripe application within the work area using the proposed materials and equipment. Apply separate test stripes in each of the line widths and configurations required herein using the proposed equipment. The test stripes shall be long enough to determine the proper speed and operating pressures for the vehicle(s) and machinery, but not less than 50 feet long.

3.3.2.2 Application Rate Demonstration

During the Test Stripe Demonstration, demonstrate compliance with the application rates specified herein. Document the equipment speed and operating pressures required to meet the specified rates in each configuration of the equipment and provide a copy of the documentation to the Contracting Officer or authorized representative prior to proceeding with the work.

3.3.2.3 Level of Performance Demonstration

The Contracting Officer or authorized representative will be present the application demonstrations to observe the results obtained and to validate the operating parameters of the vehicle(s) and equipment. If accepted by the Contracting Officer or authorized representative, the test stripe shall be the measure of performance required for this project. Work shall not proceed until the demonstration results are satisfactory to the Contracting Officer or authorized representative.

3.4 TRAFFIC CONTROL AND PROTECTION

Place warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

3.5 QUALITY ASSURANCE

Demonstrate success of bond of reflective media, new paint marking and the pavement surface, vacuum cured surface of new marking after a seven (7) day dry time. Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

-- End of Section --

SECTION 32 31 13.53

HIGH-SECURITY CHAIN LINK FENCES AND GATES
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A116	(2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A121	(2007) Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	(2011) Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A824	(2001; R 2007) Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence
ASTM C 94/C 94M	(2011) Standard Specification for Ready-Mixed Concrete
ASTM F 1043	(2011) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(2010) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F 1184	(2005; R 2010) Industrial and Commercial Horizontal Slide Gates
ASTM F 567	(2011) Standard Practice for Installation of Chain Link Fence
ASTM F 626	(2008) Standard Specification for Fence Fittings
ASTM F 900	(2005) Industrial and Commercial Swing

Gates

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191	(Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)
FS RR-F-191/1	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)
FS RR-F-191/2	(Rev E) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)
FS RR-F-191/3	(Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Installation; G
Installation Drawings; G
Location of gate, corner, end, and pull posts; G
Gate Assembly; G
Gate Hardware and Accessories; G

Installation drawings in accordance with paragraph titled, "ASSEMBLY AND INSTALLATION DRAWINGS" of this section.

SD-03 Product Data; G

Fence Installation; G
Gate Assembly; G
Gate Hardware and Accessories; G
Manufacturer's catalog data.

SD-07 Certificates

Chain Link Fence; G

Submit reports, signed by an official authorized to certify on behalf of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

Zinc Coating; G
Fabric; G
Barbed Wire; G
Stretcher Bars; G
Gate Hardware and Accessories; G

Concrete; G
GATE OPERATOR

SD-08 Manufacturer's Instructions

Submit Manufacturer's instructions for the following items:

Fence Installation; G
Gate Assembly; G
Hardware Assembly; G
Accessories; G

SD-10 Operation and Maintenance Data

Electro-Mechanical Locks
Gate Operator

Submit operating and maintenance instructions

1.3 QUALITY ASSURANCE

1.3.1 Required Report Data

Submit reports of chain-link fencing listing and accessories regarding weight in ounces for zinc coating. Submit reports demonstrating full compliance with the following standards: FS RR-F-191, FS RR-F-191/1, FS RR-F-191/2, FS RR-F-191/3, and FS RR-F-191/4

1.3.2 Assembly and Installation Drawings

Submit complete Fence Installation Drawings for review and approval by the Contracting Officer prior to shipment. Drawing details shall include, but are not limited to: Fence Installation, Location of gate, corner, end, and pull posts, Gate Assembly, and Gate Hardware and Accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 FENCE FABRIC

2.1.1 General

Provide ASTM A392, Class 1, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface. Fabricate fence fabric of 9 gauge wire woven in 2 inch mesh conforming to ASTM A116. Set fabric height as shown. Fabric shall be twisted and barbed on the top selvage and on the bottom selvage. Secure fabric to posts using stretcher bars or ties spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner, pull, and gate posts for full length of each post. Install fabric on opposite side of posts from area being secured.

2.2 POSTS

2.2.1 Metal Posts for Chain Link Fence

a. FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A. End, corner, and pull posts; Class 1, steel pipe, Grade A.

2.2.2 Accessories

a. Provide accessories conforming to ASTM F 626. Ferrous accessories shall be zinc coated.

b. Furnish truss rods for each terminal post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.

c. Provide Barbed wire supporting arms of the V 6 strand arm type and of the design required for the post furnished. Secure arms by bolting or riveting.

d. Furnish post caps in accordance with manufacturer's standard accessories.

e. Provide 9 gauge steel tie wire for attaching fabric to rails, braces, and posts and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A153/A153M unless modified.

2.3 BRACES AND RAILS

a. Braces and bottom rails; Class 1, steel pipe, Grade A , in minimum sizes listed in FS RR-F-191/3 for each class and grade.

2.4 WIRE

2.4.1 Wire Ties

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.4.2 Barbed Wire

Provide barbed wire conforming to ASTM A121 zinc-coated, Type Z, Class 3, with 12.5 gauge wire with 14 gauge, round, 4-point barbs spaced no more than 5 inches apart.

2.4.3 Tension Wire

Provide Type I or Type II tension wire, Class 4 coating, in accordance with ASTM A824.

2.5 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.6 GATES

2.6.1 Gate Assembly

Provide gate assembly conforming to ASTM F 900 and/or ASTM F 1184 of the type and swing shown. Provide gate frames conforming to strength and coating requirements of ASTM F 1083 for Group IA, steel pipe, with external coating Type A, nominal pipe size (NPS) 1-1/2. Provide gate frames conforming to strength and coating requirements of ASTM F 1043, for Group IC, steel pipe with external coating Type A or Type B, nominal pipe size (NPS) 1-1/2. Gate fabric shall be as specified for chain link fabric.

2.6.2 Gate Leaves

For gate leaves, more than 8 feet wide, provide either intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Provide intermediate braces on all gate frames with an electro-mechanical lock. Attach fabric to the gate frame by method standard with the manufacturer except that welding will not be permitted.

2.6.3 Gate Hardware and Accessories

Furnish and install latches, hinges, stops, keepers, rollers, and other hardware items as required for the operation of the gate. Arrange latches for padlocking so that the padlock will be accessible from both sides of the gate. Provide stops for holding the gates in the open position. For high security applications, each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence.

2.7 GATE OPERATOR

Provide electric gate operators for sliding gates as follows: Electrical gate operators shall have a right angle gearhead instantly reversing motor with magnetic drum-type brake, friction disc clutch, reversing starter with thermal overload protection, and a chain-driven geared rotary-type automatic limit switch. Gears shall consist of a hardened steel machine cut worm and mating bronze gear. All gears and bearings shall operate in a bath of oil. Gate operators with V-belt pulleys are not allowed. Equip gate operators with an emergency release to allow the gate to be operated manually. The emergency release mechanism shall be capable of being locked in the engaged or disengaged position. Provide positive stops on the gate tracks as a backup to the limit switches.

2.8 ELECTRO-MECHANICAL LOCKS

Electro-mechanical locking devices for sliding gates and personnel gates shall be solenoid actuated such that the deadbolt retracts when the solenoid is energized and remains electrically retracted until the gate is closed. Provide continuous duty type solenoid, rated for 120V ac, 60Hz operation. The locking device shall be unlockable by key and keyed on both sides. Status of the electro-mechanical lock shall be monitored by two limit switches (integral to the locking device) wired in series. One switch shall monitor the deadlock lever and the other monitor the locking tongue.

PART 3 EXECUTION

3.1 FENCE INSTALLATION

Perform complete installation conforming to ASTM F 567.

3.1.1 Line and Grade

Install fence to the lines and grades indicated. Clear the area on either side of the fence line to the extent indicated. Space line posts equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Provide fabric continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A780/A780M.

3.1.2 Excavation

Clear all post holes of loose material. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

3.2 POST INSTALLATION

3.2.1 Earth and Bedrock

a. Set posts plumb and in alignment. Except where solid rock is encountered, set posts in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, set posts to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, set posts to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case terminate depth of penetration. Grout all portions of posts set in rock.

b. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Make diameters of holes in solid rock at least 1 inch greater than the largest cross section of the post. Thoroughly consolidate concrete and grout around each post, free of voids and finished to form a dome. Allow concrete and grout to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Set driven posts to a minimum depth of 3 feet and protect with drive caps when setting.

Test fence post rigidity by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Test every tenth post for rigidity. When a post fails this test, make further tests on the next four posts on either side of the failed post. All failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.3 RAILS

Bolt bottom rail to rail ends and securely fasten rail ends to the posts. Peen bolts to prevent easy removal. Install rails before chain link fabric.

3.4 FABRIC INSTALLATION

a. Install chain link fabric on the side of the post indicated. Attach fabric to terminal posts with stretcher bars and tension bands. Space bands at approximately 15 inch intervals. Install fabric and pull taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fasten fabric to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 12 inch intervals.

b. Cut fabric by untwisting and removing pickets. Accomplish splicing by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 inchs above the ground.

c. After the fabric installation is complete, exercise the fabric by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2.5 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; resecure and retest all failed panels at the Contractor's expense.

3.5 SUPPORTING ARMS

Install barbed wire supporting arms and barbed wire as indicated on the drawings and as recommended by the manufacturer. Anchor supporting arms to the posts in a manner to prevent easy removal with hand tools with 3/8 inch diameter plain pin rivets. Pull barbed wire taut and attach to the arms with clips or other means that will prevent easy removal.

3.6 GATE INSTALLATION

a. Install gates at the locations shown. Mount gates to swing as indicated. Install latches, stops, and keepers as required. Install gates as recommended by the manufacturer.

b. Attach padlocks to gates or gate posts with chains. Weld or otherwise secure hinge pins, and hardware assembly to prevent removal.

c. Submit three copies of operating and maintenance instructions, a minimum of 2 weeks prior to field training. Operating instructions shall outline the step-by-step procedures required for system startup, operation, and shutdown. Include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Include in the maintenance instructions routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. Also include the general gate layout, equipment layout and simplified wiring and control diagrams of the system as installed.

3.7 GROUNDING

a. Ground fencing as indicated on drawings and specified.

b. Ground fences on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 650 feet. Bond each gate panel with a flexible bond strap to its gate post. Ground fences crossed by powerlines of 600 volts or more at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing.

c. Provide ground conductor consisting of 1/0 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10 foot long copper-clad steel rod. Drive electrodes into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall not be less than 2 feet or more than 8 feet from the fence. Clamp ground conductor to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. Total resistance of the fence to ground shall not be greater than 25 ohms.

3.8 SECURITY

Install new security fencing, remove existing security fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with Contracting Officer and cognizant Security Officer.

3.9 CLEANUP

Remove waste fencing materials and other debris from the work site each workday.

-- End of Section --

SECTION 33 11 00

WATER DISTRIBUTION
02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2008; Errata 2010) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2008) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2007) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151/A21.51	(2009) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153/A21.53	(2011) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2009) Metal-Seated Gate Valves for Water Supply Service
AWWA C502	(2005) Dry-Barrel Fire Hydrants
AWWA C509	(2009) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(2010) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains

ASME INTERNATIONAL (ASME)

ASME B16.15	(2011) Cast Bronze Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2001; R 2005) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.26	(2011) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B18.2.2	(2010) Standard for Square and Hex Nuts
ASME B18.5.2.1M	(2006; R 2011) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2010) Metric Round Head Square Neck Bolts

ASTM INTERNATIONAL (ASTM)

ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A47/A47M	(1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2008) Standard Specification for Gray Iron Castings
ASTM A536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B42	(2010) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B88	(2009) Standard Specification for Seamless Copper Water Tube

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(2010) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

UNDERWRITERS LABORATORIES (UL)

UL 246	(2011; Reprint Aug 2011) Hydrants for Fire-Protection Service
UL 262	(2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service
UL 789	(2004; Reprint Aug 2008) Standard for Indicator Posts for Fire-Protection Service

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Piping Materials; G

Water distribution main piping, fittings, joints, valves, and coupling; G

Hydrants; G

Indicator posts; G

Valve boxes; G

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings.

SD-06 Test Reports

Pressure test results from commercial laboratory.; G

SD-07 Certificates

Water distribution main piping, fittings, joints, valves, and coupling; G

Water service line piping, fittings, joints, valves, and coupling

Lining; G

Fire hydrants; G

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

SD-08 Manufacturer's Instructions

Delivery, storage, and handling; G

Installation procedures for water piping; G

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves and hydrants free of dirt and debris.

1.3.2 Handling

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

PART 2 PRODUCTS

2.1 WATER DISTRIBUTION MAIN MATERIALS

2.1.1 Piping Materials

2.1.1.1 Ductile-Iron Piping

a. Pipe and Fittings: Pipe, AWWA C151/A21.51, Pressure Class 350. Fittings, AWWA C110/A21.10 or AWWA C153/A21.53 ; fittings with push-on joint ends conforming to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, AWWA C104/A21.4, standard thickness.

b. Joints and Jointing Material:

(1) Joints: Joints for pipe and fittings shall be push-on joints or mechanical joints unless otherwise indicated. Provide mechanical joint restraint at all joints. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated.

(2) Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, AWWA C111/A21.11.

(3) Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, AWWA C111/A21.11.

(4) Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

2.1.2 Valves, Hydrants, and Other Water Main Accessories

2.1.2.1 Gate Valves on Buried Piping

AWWA C509 or UL 262. Unless otherwise specified, valves conforming to: (1) AWWA C509 shall be nonrising stem type with mechanical-joint ends or resilient-seated gate valves 3 to 12 inches in size, and (2) UL 262 shall be inside-screw type with operating nut, split-wedge type gate, designed

for a hydraulic working pressure of 250 psi, and shall have mechanical-joint ends or push-on joint ends as appropriate for the pipe to which it is joined. Materials for UL 262 valves shall conform to the reference standards specified in AWWA C500. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have 0-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. In lieu of mechanical-joint ends and push-on joint ends, valves may have special ends for connection to sleeve-type mechanical coupling. Valve ends and gaskets for connection to sleeve-type mechanical coupling shall conform to the applicable requirements specified for the coupling. Where a post indicator is shown, the valve shall have an indicator post flange. Valves shall be of one manufacturer.

2.1.2.2 Fire Hydrants

Dry-barrel type. Paint hydrants with at least one coat of primer and two coats of red enamel paint, except use black enamel paint for tops of hydrants in non-potable water systems. Stencil hydrant number and main size on the hydrant barrel using black stencil paint.

a. Dry-Barrel Type Fire Hydrants: Dry-barrel type hydrants, AWWA C502 or UL 246, "Base Valve" design, shall have 6 inch inlet, 5 1/4 inch valve opening, one 4 1/2 inch pumper connection, and two 2 1/2 inch hose connections. Inlet shall have mechanical-joint or push-on joint end; end shall conform to the applicable requirements as specified for the joint. Size and shape of operating nut, cap nuts, and threads on hose and pumper connections shall be as specified in AWWA C502 or UL 246. Hydrants indicated as "traffic type," shall have frangible sections as mentioned in AWWA C502. The traffic type hydrant shall have special couplings joining upper and lower sections of hydrant barrel and upper and lower sections of hydrant stem and shall be designed to have the special couplings break from a force not less than that which would be imposed by a moving vehicle; hydrant shall operate properly under normal conditions.

2.1.2.3 Indicator Posts

UL 789. Provide for gate valves where indicated.

2.1.2.4 Valve Boxes

Provide a valve box for each gate valve on buried piping, except where indicator post is shown. Valve boxes shall be of cast iron of a size suitable for the valve on which it is to be used and shall be adjustable. Cast-iron boxes shall have a minimum cover and wall thickness of 3/16 inch. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Cast-iron box shall have a heavy coat of bituminous paint.

2.1.2.5 Sleeve-Type Mechanical Couplings

Couplings shall be designed to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the

design shall provide for confinement and compression of the gaskets. For ductile iron pipe, the middle ring shall be of cast-iron or steel; and the follower rings shall be of malleable or ductile iron. Cast iron, ASTM A48/A48M not less than Class 25. Malleable and ductile iron shall, conform to ASTM A47/A47M and ASTM A536, respectively. Steel shall have a strength not less than that of the pipe. Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for gaskets for mechanical joint in AWWA C111/A21.11. Bolts shall be track-head type, ASTM A307, Grade A, with nuts, ASMT A563, Grade A; or round-head square-neck type bolts, ASME B18.5.2.1M and ASME B18.5.2.2M with hex nuts, ASME B18.2.2. Bolts shall be 5/8 inch in diameter; minimum number of bolts for each coupling shall be 5 for 6 inch pipe , 7 for 10 inch pipe, and 8 for 12 inch pipe. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint. Mechanical couplings shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight setting or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.

2.2 WATER SERVICE LINE MATERIALS

2.2.1 Piping Materials

2.2.1.1 Copper Pipe and Associated Fittings

Pipe, ASTM B42, regular, threaded ends. Fittings shall be brass or bronze, ASME B16.15, 125 pound.

2.2.1.2 Copper Tubing and Associated Fittings

Tubing, ASTM B88, Type K. Fittings for solder-type joint, ASME B16.18 or ASME B16.22; fittings for compression-type joint, ASME B16.26, flared tube type.

2.2.2 Water Service Line Appurtenances

2.2.2.1 Meter Boxes

The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes shall be concrete with cast iron meter reader lid. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

3.1.1.1 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

3.1.1.2 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet.

3.1.1.3 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.

3.1.1.4 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.1.5 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.2 Special Requirements for Installation of Water Mains

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

a. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical joints

with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11. Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrewed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Provide mechanical joint restraint for all joints.

b. Allowable Deflection: The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

c. Pipe Anchorage: Provide metal harness for all pipe anchorage. Metal harness shall be in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps as shown in NFPA 24 , except as otherwise indicated.

3.1.2.2 Installation of Valves and Hydrants

a. Installation of Valves: Install gate valves, AWWA C500 and UL 262, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C500. Install gate valves, AWWA C509, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C509. Make and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

b. Installation of Hydrants: Install hydrants in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached. Install hydrants with the 4 1/2 inch connections facing the adjacent paved surface. If there are two paved adjacent surfaces, contact the Contracting Officer for further instructions.

3.1.3 Special Requirements for Installation of Water Service Piping

3.1.3.1 Installation of Metallic Piping

Install pipe and fittings in accordance with paragraph entitled "General

Requirements for Installation of Pipelines" and with the applicable requirements of AWWA C600 for pipe installation, unless otherwise specified.

a. Jointing:

(1) Joints for Copper Tubing: Cut copper tubing with square ends; remove fins and burrs. Handle tubing carefully; replace dented, gouged, or otherwise damaged tubing with undamaged tubing. Make solder joints using ASTM B32, 95-5 tin-antimony or Grade Sn96 solder. Solder and flux shall contain not more than 0.2 percent lead. Before making joint, clean ends of tubing and inside of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and flare tubing.

3.1.4 Disinfection

Prior to disinfection, obtain Contracting Officer approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplying nonpotable water is not required.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing. The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Testing Procedure

Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test ductile-iron water mains in accordance with the requirements of AWWA C600 for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints shall not exceed the amounts given in AWWA C600; no leakage will be allowed at joints made by any other method.

3.2.3 Special Testing Requirements

For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of

the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be not less than 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERS
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2013) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2012) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153/A21.53	(2011) Ductile-Iron Compact Fittings for Water Service
AWWA C600	(2010) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C605	(2013) Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
AWWA C900	(2007; Errata 2008) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
AWWA M23	(2002; 2nd Ed) Manual: PVC Pipe - Design and Installation

ASTM INTERNATIONAL (ASTM)

ASTM C270	(2012a) Standard Specification for Mortar for Unit Masonry
ASTM C443	(2011) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	(2013) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C923	(2008; R 2013) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and

	Laterals
ASTM C94/C94M	(2014) Standard Specification for Ready-Mixed Concrete
ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D4101	(2011) Standard Specification for Polypropylene Injection and Extrusion Materials
ASTM F477	(2010) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1998) Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Precast concrete manhole
Metal items
Frames, covers, and gratings

SD-03 Product Data

Pipeline materials

1.3 QUALITY ASSURANCE

1.3.1 Installer Qualifications

Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Installing Contractor's License shall be current and be state certified or state registered.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

1.4.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.4.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.4.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below. Submit manufacturer's standard drawings or catalog cuts.

2.1.1 PVC Plastic Pressure Pipe and Associated Fittings

2.1.1.1 PVC Plastic Pipe and Fittings

Pipe shall conform to AWWA C900 and shall be plain end or gasket bell end, Pressure Class 150 (DR 18), with cast-iron-pipe-equivalent OD. Fittings shall be gray-iron or ductile-iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and shall have cement-mortar lining conforming to AWWA C104/A21.4, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with the PVC plastic pressure pipe specified in this paragraph.

2.1.1.2 PVC Plastic Pressure Joints and Jointing Material

Joints for pipe shall be push-on joints as specified in ASTM D3139. Joints between pipe and fittings shall be push-on joints as specified in ASTM D3139 or shall be compression-type joints/mechanical-joints as respectively specified in ASTM D3139 and AWWA C111/A21.11. Each joint connection shall be provided with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe shall conform to ASTM F477. Gaskets for push-on joints and compression-type joints/mechanical-joints for joint connections between pipe and fittings shall be as specified in AWWA C111/A21.11, respectively, for push-on joints and mechanical-joints.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to ASTM C270, Type M with Type II cement.

2.2.2 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C94/C94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Precast Concrete Manholes

Precast concrete manhole risers, base sections, and tops shall conform to ASTM C478.

2.3.2 Gaskets and Connectors

Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923 or ASTM C990.

2.3.3 Metal Items

2.3.3.1 Frames, Covers, and Gratings for Manholes

Frames and covers shall be cast iron, ductile iron or reinforced concrete. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 400 pounds. Reinforced concrete frames and covers shall be as indicated or shall conform to ASTM C478. The word "Sanitary Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.3.2 Manhole Steps

Zinc-coated steel conforming to 29 CFR 1910.27. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 10 feet, horizontal distance, to the water line.

a. Sanitary piping installation parallel with water line:

(1) Normal conditions: Sanitary piping or manholes shall be laid at least 10 feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual conditions: When local conditions prevent a horizontal separation of 10 feet, the sanitary piping or manhole may be laid closer to a water line provided that:

(a) The top (crown) of the sanitary piping shall be at least 18 inches below the bottom (invert) of the water main.

(b) Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of sanitary piping crossing a water line:

(1) Normal conditions: Lay sanitary sewer piping by crossing under water lines to provide a separation of at least 18 inches between the top of the sanitary piping and the bottom of the water line whenever possible.

(2) Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.

(b) Sanitary piping passing over water lines shall, in addition, be protected by providing:

(1) A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of the water line.

(2) Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.

(3) That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

c. Sanitary sewer manholes: No water piping shall pass through or come in

contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved.

3.1.1.4 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of PVC Plastic Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section; with the requirements of AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation."

Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to fittings, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23, Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners specified for this type joint and assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600

for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.

3.1.3 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

3.1.4 Miscellaneous Construction and Installation

3.1.4.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.4.2 Metal Work

a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

b. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. Perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Low-pressure air tests: Perform tests as follows:

(1) PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

-- End of Section --

SECTION 33 40 00

STORM DRAINAGE UTILITIES
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM A929/A929M	(2001; R 2013) Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM B26/B26M	(2012) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C1433	(2014) Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C270	(2012a) Standard Specification for Mortar for Unit Masonry
ASTM C32	(2013) Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C425	(2004; R 2013) Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C443	(2011) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	(2013) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C55	(2011) Concrete Brick
ASTM C62	(2013a) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C76	(2014) Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D1557	(2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2167	(2008) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Placing Pipe; G
Pipe for Culverts and Storm Drains; G
Frame and Cover for Gratings; G
Precast Concrete Structures; G

Submit printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-07 Certificates

Determination of Density

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

Manufactured in accordance with and conforming to ASTM C76, Class III.

2.2 DRAINAGE STRUCTURES

2.2.1 Flared End Sections

Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A929/A929M.

2.2.2 Precast Reinforced Concrete Box

Manufactured in accordance with and conforming to ASTM C1433.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 4,000 psi concrete.

2.3.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.3 Brick

Brick shall conform to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

2.3.4 Precast Reinforced Concrete Manholes

Conform to ASTM C478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure.

2.3.5 Frame and Cover for Gratings

Submit certification on the ability of frame and cover or gratings to carry the imposed live load. Frame and cover for gratings shall be cast gray iron, ASTM A48/A48M, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26/B26M, Alloy 356.OT6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.6 Joints

2.3.6.1 Flexible Watertight Joints

a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Factory-fabricated resilient joint materials shall conform to ASTM C425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 23 00.00 20 EXCAVATION AND FILL and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 12 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material,

compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Depth of granular bedding in trenches with rock foundation shall be 1/2 inch in depth per foot of depth of fill, minimum depth of bedding shall be 8 inch up to maximum depth of 24 inches. The middle third of the granular bedding shall be loosely placed. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.4 JOINTING

3.4.1 Concrete Pipe

3.4.1.1 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.5 DRAINAGE STRUCTURES

3.5.1 Manholes and Inlets

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete, precast concrete segmental blocks, prefabricated corrugated metal, or bituminous coated corrugated metal; complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated. Pipe studs and junction chambers of prefabricated corrugated metal manholes shall be fully bituminous-coated and paved when the connecting branch lines are so treated. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.5.2 Walls and Headwalls

Construction shall be as indicated.

3.6 BACKFILLING

3.6.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of RCP or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 6 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.6.2 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.6.3 Compaction

3.6.3.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will

show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.6.3.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.6.4 Determination of Density

Testing is the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.7 PIPELINE TESTING

3.7.1 Post-Installation Inspection

One hundred percent of all reinforced concrete pipe installations shall be checked for joint separations, soil migration through the joint, cracks greater than 0.01 inches, settlement and alignment.

a. Replace pipes having cracks greater than 0.1 inches in width or deflection greater than 5 percent deflection. An engineer shall evaluate all pipes with cracks greater than 0.01 inches but less than 0.10 inches to determine if any remediation or repair is required. Repair or replace any pipe with crack exhibiting displacement across

the crack, exhibiting bulges, creases, tears, spalls, or delamination.

-- End of Section --

SECTION 33 71 01

OVERHEAD TRANSMISSION AND DISTRIBUTION
07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A475	(2003a; E 2009; R 2009) Standard Specification for Zinc-Coated Steel Wire Strand
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B3	(2013) Standard Specification for Soft or Annealed Copper Wire
ASTM D1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-6 2013) National Electrical Safety Code
IEEE C37.42	(2009) Standard Specifications for High-Voltage (> 1000 V) Expulsion-Type

	Distribution-Class Fuses, Fuse and Disconnecting Cutouts, Fuse Disconnecting Switches, and Fuse Links, and Accessories Used with These Devices
IEEE C62.11	(2012) Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2013) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C29.4	(1989; R 2012) Standard for Wet-Process Porcelain Insulators - Strain Type
ANSI C29.5	(1984; R 2002) Wet-Process Porcelain Insulators (Low and Medium Voltage Pin Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS 202-1	(2004) List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers

UNDERWRITERS LABORATORIES (UL)

UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2013; Reprint Dec 2013) Wire Connectors
UL 510	(2005; Reprint Jul 2013) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel

1.2 RELATED REQUIREMENTS

Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in

IEEE 100.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulators; G

Cutouts; G

Surge arresters; G

Guy strand

Anchors

SD-06 Test Reports

Field Quality Control; G

Ground resistance test reports; G

Submit report of the acceptance test results as specified by paragraph entitled "Field Quality Control"

1.5 QUALITY ASSURANCE

1.5.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 and IEEE C2 unless more stringent requirements are specified or indicated.

1.5.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.5.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5.3 Ground Resistance Test Reports

Submit the measured ground resistance of grounding system. When testing grounding electrodes and grounding systems, identify each grounding electrode and each grounding system for testing. Include the test method and test setup (i.e. pin location) used to determine ground resistance and soil conditions at the time the measurements were made.

1.6 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Consider materials specified herein or shown on contract drawings which are identical to materials listed in RUS 202-1 as conforming to requirements. Equipment and component items, not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 120 hours of exposure to the salt spray test specified in ASTM B117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The described test mark and test evaluation shall be in accordance with ASTM D1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.2 HARDWARE

Hardware shall be hot-dip galvanized in accordance with ASTM A153/A153M and ASTM A123/A123M.

2.3 INSULATORS

Provide wet-process porcelain insulators which are radio interference free.

a. Guy strain insulators: ANSI C29.4, Class 54-4.

e. Pin insulators: ANSI C29.5, Class 55-3.

2.4 OVERHEAD CONNECTORS AND SPLICES

2.4.1 Connectors and Splices

Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition, aluminum-composition to copper, and copper-to-copper shall comply with UL 486A-486B.

2.5 GUY STRAND

ASTM A475, high-strength, Class A or B, galvanized strand steel cable. Guy strand shall be 5/16 inch in diameter with a minimum breaking strength of 6,000 pounds. Provide guy terminations designed for use with the particular strand and developing at least the ultimate breaking strength of the strand.

2.6 ROUND GUY MARKERS

Vinyl or PVC material, yellow colored, 8 feet long and shatter resistant at sub-zero temperatures.

2.6.1 Guy Attachment

Thimble eye guy attachment.

2.7 ANCHORS AND ANCHOR RODS

Anchors shall present holding area indicated on drawings as a minimum. Anchor rods shall be triple thimble-eye, 3/4 inch diameter by 8 feet long. Anchors and anchor rods shall be hot dip galvanized.

2.7.1 Screw Anchors

Screw type anchors having a manufacturer's rating of not less than 23,000 pounds in loose to medium sand/clay soil, Class 6 and extra heavy pipe rods conforming to ASTM A53/A53M, Schedule 80, and couplings conforming to ASME B16.11.

2.8 GROUNDING AND BONDING

2.8.1 Driven Ground Rods

Provide copper-clad steel ground rods conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used for rods 20 feet or longer.

2.8.2 Grounding Conductors

ASTM B3. Provide soft drawn copper wire ground conductors a minimum No. 4

AWG. Ground wire protectors shall be PVC.

2.8.3 Grounding Connections

UL 467. Exothermic weld or compression connector.

2.9 SURGE ARRESTERS

IEEE C62.11, metal oxide, polymeric-housed, surge arresters arranged for crossarm mounting. RMS voltage rating shall be 12 kV. Arresters shall be Distribution class.

2.10 FUSED CUTOUTS

Open type fused cutouts rated 100 amperes 15/26 kV gnd Y, conforming to IEEE C37.42. Type K fuses conforming to IEEE C37.42 with ampere ratings as indicated. Open link type fuse cutouts are not acceptable.

2.11 CONDUIT RISERS AND CONDUCTORS

The riser shield shall be PVC containing a PVC back plate and PVC extension shield or a rigid galvanized steel conduit, as indicated, and conforming to UL 6. Provide conductors and terminations as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

2.12 ELECTRICAL TAPES

Tapes shall be UL listed for electrical insulation and other purposes in wire and cable splices. Terminations, repairs and miscellaneous purposes, electrical tapes shall comply with UL 510.

2.13 CAULKING COMPOUND

Compound for sealing of conduit risers shall be of a puttylike consistency workable with hands at temperatures as low as 35 degrees F, shall not slump at a temperature of 300 degrees F, and shall not harden materially when exposed to air. Compound shall readily caulking or adhere to clean surfaces of the materials with which it is designed to be used. Compound shall have no injurious effects upon the workmen or upon the materials.

2.14 NAMEPLATES

2.14.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable. Equipment containing liquid-dielectrics shall have the type of dielectric on the nameplate.

2.14.2 Field Fabricated Nameplates

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering

shall be a minimum of 0.25 inch high normal block style.

PART 3 EXECUTION

3.1 INSTALLATION

Provide overhead pole line installation conforming to requirements of IEEE C2 for Grade B construction of overhead lines in medium loading districts and NFPA 70 for overhead services. Provide material required to make connections into existing system and perform excavating, backfilling, and other incidental labor. Consider street, alleys, roads and drives "public." Pole configuration shall be as indicated.

3.1.1 Anchors and Guys

Place anchors in line with strain. The length of the guy lead (distance from base of pole to the top of the anchor rod) shall be as indicated.

3.1.1.1 Setting Anchors

Set anchors in place with anchor rod aligned with, and pointing directly at, guy attachment on the pole with the anchor rod projecting 6 to 9 inches out of ground to prevent burial of rod eye.

3.1.1.2 Backfilling Near Anchors

Backfill expanding, concrete, or cone type anchors with tightly tamped coarse rock 2 feet immediately above anchor and then with tightly tamped earth filling remainder of hole.

3.1.1.3 Screw Anchors

Install screw anchors by torquing with boring machine.

3.1.1.4 Guy Installation

Provide guys where indicated, with loads and strengths as indicated, and wherever conductor tensions are not balanced, such as at angles, corners and dead-ends. Where single guy will not provide the required strength, two or more guys shall be provided. Where guys are wrapped around poles, at least two guy hooks shall be provided. Provide pole shims where guy tension exceeds 6000 pounds. Guy clamps 6 inches in length with three 5/8 inch bolts, or offset-type guy clamps, or approved guy grips shall be provided at each guy terminal. Securely clamp plastic guy marker to the guy or anchor at the bottom and top of marker.Complete anchor and guy installation, dead end to dead end, and tighten guy before wire stringing and sagging is begun on that line section.

3.1.2 Hardware

Provide hardware with washer against wood and with nuts and lock nuts applied wrench tight. Provide locknuts on threaded hardware connections. Locknuts shall be M-F style and not palnut style.

3.1.3 Grounding

Unless otherwise indicated, grounding shall conform to IEEE C2 and NFPA 70.

3.1.3.1 Grounding Electrode Installation

Grounding electrodes shall be installed as follows:

a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be located approximately 3 feetout from base of the pole and shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade. Multiple rods shall be evenly spaced at least 10 feet apart and connected together 2 feet below grade with a minimum No. 6 bare copper conductor.

3.1.3.2 Grounding Electrode Conductors

Grounding electrode conductors shall be sized as indicated. Secondary system neutral conductors shall be connected directly to the transformer neutral bushings, then connected with a neutral bonding jumper between the transformer neutral bushing and the vertical grounding electrode conductor as indicated. Bends greater than 45 degrees in grounding electrode conductor are not permitted.

3.1.3.3 Grounding Electrode Connections

Make above grade grounding connections on pole lines by exothermic weld or by using a compression connector. Make below grade grounding connections by exothermic weld. Make exothermic welds strictly in accordance with manufacturer's written recommendations. Welds which have puffed up or which show convex surfaces indicating improper cleaning, are not acceptable. No mechanical connectors are required at exothermic weldments. Compression connectors shall be type that uses a hydraulic compression tool to provide correct pressure. Provide tools and dies recommended by compression connector manufacturer. An embossing die code or similar method shall provide visible indication that a connector has been fully compressed on ground wire.

3.1.3.4 Grounding and Grounded Connections

a. Where no primary or common neutral exists, surge arresters and frames of equipment operating at over 750 volts shall be bonded together and connected to a dedicated primary grounding electrode.

b. Where no primary or common neutral exists, transformer secondary neutral bushing, secondary neutral conductor, and frames of equipment operating at under 750 volts shall be bonded together and connected to a dedicated secondary grounding electrode.

c. When a primary or common neutral exists, connect all grounding and grounded conductors to a common grounding electrode.

3.1.3.5 Protective Molding

Protect grounding conductors which are run on surface of wood poles by PVC molding extending from ground line throughout communication and transformer spaces.

3.1.4 Risers

Secure galvanized steel conduits on poles by two hole galvanized steel pipe straps spaced as indicated and within 3 feet of any outlet or termination. Ground metallic conduits.

3.2 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.3 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.4 FIELD QUALITY CONTROL

3.4.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 15 days prior to conducting tests. The Contractor shall furnish materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field reports will be signed and dated by the Contractor.

3.4.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.4.3 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.4.3.1 Grounding System

a. Visual and mechanical inspection

Inspect ground system for compliance with contract plans and specifications.

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable ground testing megger in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

3.4.4 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least three times, demonstrating satisfactory operation each time.

3.4.5 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --

SECTION 33 71 02

UNDERGROUND ELECTRICAL DISTRIBUTION
02/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO HB-17	(2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 318M	(2011; Errata 2013) Building Code Requirements for Structural Concrete & Commentary
ACI SP-66	(2004) ACI Detailing Manual

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS8	(2007) specification for Extruded Dielectric Shielded Power Cables Rated 5 Through 46 kV

ASTM INTERNATIONAL (ASTM)

ASTM B1	(2013) Standard Specification for Hard-Drawn Copper Wire
ASTM B3	(2013) Standard Specification for Soft or Annealed Copper Wire
ASTM B496	(2013a) Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
ASTM B8	(2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C32	(2013) Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)

ASTM C478	(2013) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C857	(2013) Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM F512	(2012) Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 386	(2006; INT 1 2011) Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V
IEEE 400.2	(2013) Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE 404	(2012) Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500,000 V
IEEE 48	(2009) Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-6 2013) National Electrical Safety Code
IEEE Stds Dictionary	(2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2013) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C119.1	(2011) Electric Connectors - Sealed Insulated Underground Connector Systems Rated 600 Volts

ANSI/NEMA WC 71/ICEA S-96-659	(1999) Standard for Nonshielded Cables Rated 2001-5000 Volts for use in the Distribution of Electric Energy
NEMA TC 2	(2013) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 9	(2004) Standard for Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation
NEMA WC 74/ICEA S-93-639	(2012) 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-758	(2012b) Customer-Owned Outside Plant Telecommunications Infrastructure Standard

THE SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS (SCTE)

ANSI/SCTE 77	(2013) Specification for Underground Enclosure Integrity

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS Bull 1751F-644	(2002) Underground Plant Construction

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60005	(Basic; Notice 2) Frames, Covers, Gratings, Steps, Sump And Catch Basin, Manhole

UNDERWRITERS LABORATORIES (UL)

UL 1072	(2006; Reprint Jun 2013) Medium-Voltage Power Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2013; Reprint Dec 2013) Wire Connectors
UL 510	(2005; Reprint Jul 2013) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514B	(2012) Conduit, Tubing and Cable Fittings
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel

UL 651	(2011; Reprint Mar 2012) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 83	(2008) Thermoplastic-Insulated Wires and Cables
UL 854	(2004; Reprint Sep 2011) Standard for Service-Entrance Cables

1.2 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE Stds Dictionary.

b. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

c. In the text of this section, "medium voltage cable splices," and "medium voltage cable joints" are used interchangeably and have the same meaning.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Precast underground structures; G

SD-03 Product Data

Medium voltage cable; G

Medium voltage cable joints; G

Medium voltage cable terminations; G

Precast concrete structures; G

Sealing Material

Pulling-In Irons

Manhole frames and covers; G

Handhole frames and covers; G

Composite/fiberglass handholes; G

Cable supports (racks, arms and insulators); G

SD-06 Test Reports

Medium voltage cable qualification and production tests; G

Field Acceptance Checks and Tests; G

Arc-proofing test for cable fireproofing tape; G

Cable Installation Plan and Procedure; G

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each cable pull. Separate sections by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

a. Site layout drawing with cable pulls numerically identified.

b. A list of equipment used, with calibration certifications. The manufacturer and quantity of lubricant used on pull.

c. The cable manufacturer and type of cable.

d. The dates of cable pulls, time of day, and ambient temperature.

e. The length of cable pull and calculated cable pulling tensions.

f. The actual cable pulling tensions encountered during pull.

SD-07 Certificates

Cable splicer/terminator; G

Cable Installer Qualifications; G

1.4 QUALITY ASSURANCE

1.4.1 Precast Underground Structures

Submittal required for each type used. Provide calculations and drawings for precast manholes and handholes bearing the seal of a registered professional engineer including:

a. Material description (i.e., f'c and Fy)

b. Manufacturer's printed assembly and installation instructions

c. Design calculations

d. Reinforcing shop drawings in accordance with ACI SP-66

e. Plans and elevations showing opening and pulling-in iron locations and details

1.4.2 Certificate of Competency for Cable Splicer/Terminator

The cable splicer/terminator must have a certification from the National Cable Splicing Certification Board (NCSCB) in the field of splicing and terminating shielded medium voltage (5 kV to 35 kV) power cable using

pre-manufactured kits (pre-molded, heat-shrink, cold shrink). Submit "Proof of Certification" for approval, for the individuals that will be performing cable splicer and termination work, 30 days before splices or terminations are to be made.

1.4.3 Cable Installer Qualifications

Provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. Provide a resume showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers. Cable installer must demonstrate experience with a minimum of three medium voltage cable installations. The Contracting Officer reserves the right to require additional proof of competency or to reject the individual and call for an alternate qualified cable installer.

1.4.4 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of IEEE C2 and NFPA 70 unless more stringent requirements are specified or indicated.

1.4.5 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.5.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.5.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable, unless specified otherwise.

PART 2 PRODUCTS

2.1 CONDUIT, DUCTS, AND FITTINGS

2.1.1 Rigid Metal Conduit

UL 6.

2.1.2 Plastic Conduit for Direct Burial

UL 651, Schedule 40.

2.1.3 Plastic Duct for Concrete Encasement

UL 651 and ASTM F512, NEMA TC 2, Type EPC-40-PVC.

2.1.4 Innerduct

Provide corrugated polyethylene (PE) or PVC innerducts, or fabric-mesh innerducts, with pullwire. Size as indicated.

2.1.5 Conduit Sealing Compound

Compounds for sealing ducts and conduit must have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, must neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds must adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds must form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds must have no injurious effect upon the hands of workmen or upon materials.

2.1.6 Fittings

2.1.6.1 Metal Fittings

UL 514B.

2.1.6.2 PVC Conduit Fittings

UL 514B, UL 651.

2.1.6.3 PVC Duct Fittings

NEMA TC 9.

2.2 LOW VOLTAGE INSULATED CONDUCTORS AND CABLES

Insulated conductors must be rated 600 volts and conform to the requirements of NFPA 70, including listing requirements. Wires and cables manufactured more than 24 months prior to date of delivery to the site are not acceptable. Service entrance conductors must conform to UL 854, type USE.

2.2.1 Conductor Types

Cable and duct sizes indicated are for copper conductors and THHN/THWN unless otherwise noted. Conductors No. 10 AWG and smaller must be solid.

Conductors No. 8 AWG and larger must be stranded. All conductors must be copper.

2.2.2 Conductor Material

Unless specified or indicated otherwise or required by NFPA 70, wires in conduit, other than service entrance, must be 600-volt, Type THWN/THHN conforming to UL 83. Copper conductors must be annealed copper complying with ASTM B3 and ASTM B8.

2.2.3 In Duct

2.2.4 Cable Marking

Insulated conductors must have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length.

Identify each cable by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag must contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

Conductors must be color coded. Provide conductor identification within each enclosure where a tap, splice, or termination is made. Conductor identification must be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, heat shrink type sleeves,or colored electrical tape. Control circuit terminations must be properly identified. Color must be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals must be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems must be as follows:

a. 208/120 volt, three-phase

(1) Phase A - black

(2) Phase B - red

(3) Phase C - blue

2.3 LOW VOLTAGE WIRE CONNECTORS AND TERMINALS

Must provide a uniform compression over the entire conductor contact surface. Use solderless terminal lugs on stranded conductors.

a. For use with copper conductors: UL 486A-486B.

2.4 LOW VOLTAGE SPLICES

Provide splices in conductors with a compression connector on the conductor and by insulating and waterproofing using one of the following methods which are suitable for continuous submersion in water and comply with ANSI C119.1.

2.4.1 Heat Shrinkable Splice

Provide heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material applied in accordance with the manufacturer's written instructions.

2.4.2 Cold Shrink Rubber Splice

Provide a cold-shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation must not require heat or flame, or any additional materials such as covering or adhesive. It must be designed for use with inline compression type connectors, or indoor, outdoor, direct-burial or submerged locations.

2.5 MEDIUM VOLTAGE CABLE

Cable (conductor) sizes are designated by American Wire Gauge (AWG) and Thousand Circular Mils (Kcmil). Conductor and conduit sizes indicated are for copper conductors unless otherwise noted. Insulated conductors must have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout cable length. Wires and cables manufactured more than 24 months prior to date of delivery to the site are not acceptable. Provide single conductor type cables unless otherwise indicated.

2.5.1 Cable Configuration

Provide Type MV cable, conforming to NEMA WC 74/ICEA S-93-639 and UL 1072 . Provide cables manufactured for use in duct applications. Cable must be rated 15 kV with 133 percent insulation level.

2.5.2 Conductor Material

Provide concentric-lay-stranded, Class B compact round conductors. Provide soft drawn copper cables complying with ASTM B3 and ASTM B8 for regular concentric and compressed stranding or ASTM B496 for compact stranding.

2.5.3 Insulation

Provide ethylene-propylene-rubber (EPR) insulation conforming to the requirements of ANSI/NEMA WC 71/ICEA S-96-659 and AEIC CS8.

2.5.4 Shielding

Cables rated for 2 kV and above must have a semiconducting conductor shield, a semiconducting insulation shield, and an overall copper tape shield for each phase.

2.5.5 Neutrals

Neutral conductors must be copper, employing the same insulation and jacket materials as phase conductors, except that a 600-volt insulation rating is acceptable.2.5.6 Jackets

Provide cables with a PVC jacket. Provide PVC jackets with a separator that prevents contact with underlying semiconducting insulating shield.

2.6 MEDIUM VOLTAGE CABLE TERMINATIONS

IEEE 48 Class 1; of the molded elastomer, prestretched elastomer, or heat-shrinkable elastomer. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations, where required, must be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, or armor. Terminations must be provided in a kit, including: skirts, stress control terminator, ground clamp, connectors, lugs, and complete instructions for assembly and installation. Terminations must be the product of one manufacturer, suitable for the type, diameter, insulation class and level, and materials of the cable terminated. Do not use separate parts of copper or copper alloy in contact with aluminum alloy parts in the construction or installation of the terminator.

2.6.1 Cold-Shrink Type

Terminator must be a one-piece design, utilizing the manufacturer's latest technology, where high-dielectric constant (capacitive) stress control is integrated within a skirted insulator made of silicone rubber. Termination must not require heat or flame for installation. Termination kit must contain all necessary materials (except for the lugs). Termination must be designed for installation in low or highly contaminated indoor and outdoor locations and must resist ultraviolet rays and oxidative decomposition.

2.6.2 Heat Shrinkable Type

Terminator must consist of a uniform cross section heat shrinkable polymeric construction stress relief tubing and environmentally sealed outer covering that is nontracking, resists heavy atmospheric contaminants, ultra violet rays and oxidative decomposition. Provide heat shrinkable sheds or skirts of the same material. Termination must be designed for installation in low or highly contaminated indoor or outdoor locations.

2.6.3 Separable Insulated Connector Type

IEEE 386. Provide connector with steel reinforced hook-stick eye, grounding eye, test point, and arc-quenching contact material. Provide connectors of the loadbreak or deadbreak type as indicated, of suitable construction for the application and the type of cable connected, and that include cable shield adaptors. Provide external clamping points and test points. Separable connectors must not be used in manholes/handholes.

a. 200 Ampere loadbreak connector ratings: Voltage: 15 kV, 95 kV BIL. Short time rating: 10,000 rms symmetrical amperes.

b. 600 Ampere deadbreak connector ratings: Voltage: 15 kV, 95 kV BIL. Short time rating: 25,000 rms symmetrical amperes. Connectors must have 200 ampere bushing interface for surge arresters.

2.7 MEDIUM VOLTAGE CABLE JOINTS

Provide joints (splices) in accordance with IEEE 404 suitable for the rated voltage, insulation level, insulation type, and construction of the cable. Joints must be certified by the manufacturer for waterproof, submersible

applications. Upon request, supply manufacturer's design qualification test report in accordance with IEEE 404. Connectors for joint must be tin-plated electrolytic copper, having ends tapered and having center stops to equalize cable insertion.

2.7.1 Heat-Shrinkable Joint

Consists of a uniform cross-section heat-shrinkable polymeric construction with a linear stress relief system, a high dielectric strength insulating material, and an integrally bonded outer conductor layer for shielding. Replace original cable jacket with a heavy-wall heat-shrinkable sleeve with hot-melt adhesive coating.

2.7.2 Cold-Shrink Rubber-Type Joint

Joint must be of a cold shrink design that does not require any heat source for its installation. Splice insulation and jacket must be of a one-piece factory formed cold shrink sleeve made of black EPDM rubber. Splice must be packaged three splices per kit, including complete installation instructions.

2.8 TAPE

2.8.1 Insulating Tape

UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

2.8.2 Buried Warning and Identification Tape

Provide detectable tape in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

2.8.3 Fireproofing Tape

Provide tape composed of a flexible conformable unsupported intumescent elastomer. Tape must be not less than .030 inch thick, noncorrosive to cable sheath, self-extinguishing, noncombustible, and must not deteriorate when subjected to oil, water, gases, salt water, sewage, and fungus.

2.9 PULL ROPE

Plastic or flat pull line (bull line) having a minimum tensile strength of 200 pounds.

2.10 GROUNDING AND BONDING

2.10.1 Driven Ground Rods

Provide copper-clad steel ground rods conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used for rods 20 feet or longer.

2.10.2 Grounding Conductors

Stranded-bare copper conductors must conform to ASTM B8, Class B, soft-drawn unless otherwise indicated. Solid-bare copper conductors must conform to ASTM B1 for sizes No. 8 and smaller. Insulated conductors must be of the same material as phase conductors and green color-coded, except

that conductors must be rated no more than 600 volts. Aluminum is not acceptable.

2.11 CAST-IN-PLACE CONCRETE

Provide concrete in accordance with Section 32 16 13 CONCRETE SIDEWALKS AND CURBS AND GUTTERS. In addition, provide concrete for encasement of underground ducts with 3000 psi minimum 28-day compressive strength. Concrete associated with electrical work for other than encasement of underground ducts must be 4000 psi minimum 28-day compressive strength unless specified otherwise.

2.12 UNDERGROUND STRUCTURES

Provide precast concrete underground structures or standard type cast-in-place manhole types as indicated, conforming to ASTM C857 and ASTM C478. Top, walls, and bottom must consist of reinforced concrete. Walls and bottom must be of monolithic concrete construction. Locate duct entrances and windows near the corners of structures to facilitate cable racking. Covers must fit the frames without undue play. Form steel and iron to shape and size with sharp lines and angles. Castings must be free from warp and blow holes that may impair strength or appearance. Exposed metal must have a smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. Install a pulling-in iron in the wall opposite each duct line entrance. Cable racks, including rack arms and insulators, must be adequate to accommodate the cable.

2.12.1 Cast-In-Place Concrete Structures

Concrete must conform to Section 32 16 13 CONCRETE SIDEWALKS AND CURBS AND GUTTERS. Construct walls on a footing of cast-in-place concrete except that precast concrete base sections may be used for precast concrete manhole risers.

2.12.2 Precast Concrete Structures, Risers and Tops

Precast concrete underground structures may be provided in lieu of cast-in-place subject to the requirements specified below. Precast units must be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes.

2.12.2.1 General

Precast concrete structures must have the same accessories and facilities as required for cast-in-place structures. Likewise, precast structures must have plan area and clear heights not less than those of cast-in-place structures. Concrete materials and methods of construction must be the same as for cast-in-place concrete construction, as modified herein. Slope in floor may be omitted provided precast sections are poured in reinforced steel forms. Concrete for precast work must have a 28-day compressive strength of not less than 4000 psi. Structures may be precast to the design and details indicated for cast-in-place construction, precast monolithically and placed as a unit, or structures may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. Structures must be identified with the manufacturer's name embedded in or otherwise permanently attached to an interior wall face.

2.12.2.2 Design for Precast Structures

ACI 318M. In the absence of detailed on-site soil information, design for the following soil parameters/site conditions:

a. Angle of Internal Friction (phi) = 30 degrees

b. Unit Weight of Soil (Dry) = 110 pcf, (Saturated) = 130 pcf

c. Coefficient of Lateral Earth Pressure (Ka) = 0.33

d. Ground Water Level = 3 feet below ground elevation

e. Vertical design loads must include full dead, superimposed dead, and live loads including a 30 percent magnification factor for impact. Live loads must consider all types and magnitudes of vehicular (automotive, industrial, or aircraft) traffic to be encountered. The minimum design vertical load must be for H20 highway loading per AASHTO HB-17.

f. Horizontal design loads must include full geostatic and hydrostatic pressures for the soil parameters, water table, and depth of installation to be encountered. Also, horizontal loads imposed by adjacent structure foundations, and horizontal load components of vertical design loads, including impact, must be considered, along with a pulling-in iron design load of 6000 pounds.

g. Each structural component must be designed for the load combination and positioning resulting in the maximum shear and moment for thatparticular component.

h. Design must also consider the live loads induced in the handling, installation, and backfilling of the manholes. Provide lifting devices to ensure structural integrity during handling and installation.

2.12.2.3 Construction

Structure top, bottom, and wall must be of a uniform thickness of not less than 6 inches. Thin-walled knock-out panels for designed or future duct bank entrances are not permitted. Provide quantity, size, and location of duct bank entrance windows as directed, and cast completely open by the precaster. Size of windows must exceed the nominal duct bank envelope dimensions by at least 12 inches vertically and horizontally to preclude in-field window modifications made necessary by duct bank misalignment. However, the sides of precast windows must be a minimum of 6 inches from the inside surface of adjacent walls, floors, or ceilings. Form the perimeter of precast window openings to have a keyed or inward flared surface to provide a positive interlock with the mating duct bank envelope. Provide welded wire fabric reinforcing through window openings for in-field cutting and flaring into duct bank envelopes. Provide additional reinforcing steel comprised of at least two No. 4 bars around window openings. Provide drain sumps a minimum of 12 inches in diameter and 4 inches deep for precast structures.

2.12.2.4 Joints

Provide tongue-and-groove joints on mating edges of precast components. Shiplap joints are not allowed. Design joints to firmly interlock

adjoining components and to provide waterproof junctions and adequate shear transfer. Seal joints watertight using preformed plastic strip conforming to ASTM C990. Install sealing material in strict accordance with the sealant manufacturer's printed instructions. Provide waterproofing at conduit/duct entrances into structures, and where access frame meets the top slab, provide continuous grout seal.

2.12.3 Manhole Frames and Covers

Provide cast iron frames and covers for manholes conforming to CID A-A-60005. Cast the words "ELECTRIC" or "TELECOMMUNICATIONS" in the top face of power and telecommunications manhole covers, respectively.

2.12.4 Handhole Frames and Covers

Frames and covers of steel must be welded by qualified welders in accordance with standard commercial practice. Steel covers must be rolled-steel floor plate having an approved antislip surface. Hinges must be of wrought steel, 5 by 5 inches by approximately 3/16 inch thick, without screw holes, and must be for full surface application by fillet welding. Hinges must have nonremovable pins and five knuckles. The surfaces of plates under hinges must be true after the removal of raised antislip surface, by grinding or other approved method.

2.12.5 Brick for Manhole Collar

Provide sewer and manhole brick conforming to ASTM C32, Grade MS.

2.12.6 Composite/Fiberglass Handholes and Covers

Provide handholes and covers of polymer concrete, reinforced with heavy weave fiberglass conforming to ANSI/SCTE 77.

2.13 CABLE SUPPORTS (RACKS, ARMS, AND INSULATORS)

The metal portion of racks and arms must be zinc-coated after fabrication.

2.13.1 Cable Rack Stanchions

The wall bracket or stanchion must be 4 inches by approximately 1 inch glass-reinforced nylon with recessed bolt mounting holes, 48 inches long (minimum) in manholes. Slots for mounting cable rack arms must be spaced at 8 inch intervals.

2.13.2 Rack Arms

Cable rack arms must be glass reinforced nylon and must be of the removable type. Rack arm length must be a minimum of 8 inches and a maximum of 12 inches.

2.13.3 Insulators

Insulators for metal rack arms must be dry-process glazed porcelain. Insulators are not required for nylon arms.

2.14 CABLE TAGS IN MANHOLES

Provide tags for each power cable located in manholes. The tags must be polyethylene. Do not provide handwritten letters. The first position on

the power cable tag must denote the voltage. The second through sixth positions on the tag must identify the circuit. The next to last position must denote the phase of the circuit and include the Greek "phi" symbol. The last position must denote the cable size. As an example, a tag could have the following designation: "11.5 NAS 1-8(Phase A)500," denoting that the tagged cable is on the 11.5kV system circuit number NAS 1-8, underground, Phase A, sized at 500 kcmil.

2.14.1 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 3250 pounds per square inch; and that are 0.08 inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 170 degrees F. Provide 0.05 inch (minimum) thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties must have a minimum loop tensile strength of 175 pounds. The cable tags must have black block letters, numbers, and symbols one inch high on a yellow background. Letters, numbers, and symbols must not fall off or change positions regardless of the cable tags' orientation.

2.15 SOURCE QUALITY CONTROL

2.15.1 Arc-Proofing Test for Cable Fireproofing Tape

Manufacturer must test one sample assembly consisting of a straight lead tube 12 inches long with a 2 1/2 inch outside diameter, and a 1/8 inch thick wall, and covered with one-half lap layer of arc and fireproofing tape per manufacturer's instructions. The arc and fireproofing tape must withstand extreme temperature of a high-current fault arc 13,000 degrees K for 70 cycles as determined by using an argon directed plasma jet capable of constantly producing and maintaining an arc temperature of 13,000 degrees K. Temperature (13,000 degrees K) of the ignited arc between the cathode and anode must be obtained from a dc power source of 305 (plus or minus 5) amperes and 20 (plus or minus 1) volts. The arc must be directed toward the sample assembly accurately positioned 5 (plus or minus 1) millimeters downstream in the plasma from the anode orifice by fixed flow rate of argon gas (0.18 g per second). Each sample assembly must be tested at three unrelated points. Start time for tests must be taken from recorded peak current when the specimen is exposed to the full test temperature. Surface heat on the specimen prior to that time must be minimal. The end point is established when the plasma or conductive arc penetrates the protective tape and strikes the lead tube. Submittals for arc-proofing tape must indicate that the test has been performed and passed by the manufacturer.

2.15.2 Medium Voltage Cable Qualification and Production Tests

Results of AEIC CS8 qualification and production tests as applicable for each type of medium voltage cable.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable. In addition to these requirements, install telecommunications in accordance with TIA-758 and RUS Bull 1751F-644.

3.2 CABLE INSPECTION

Inspect each cable reel for correct storage positions, signs of physical damage, and broken end seals prior to installation. If end seal is broken, remove moisture from cable prior to installation in accordance with the cable manufacturer's recommendations.

3.3 CABLE INSTALLATION PLAN AND PROCEDURE

Obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure. Perform pulling calculations and prepare a pulling plan and submit along with the manufacturer's instructions in accordance with SUBMITTALS. Install cable strictly in accordance with the cable manufacturer's recommendations and the approved installation plan.

Calculations and pulling plan must include:

a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.

b. List of cable installation equipment.

c. Lubricant manufacturer's application instructions.

d. Procedure for resealing cable ends to prevent moisture from entering cable.

e. Cable pulling tension calculations of all cable pulls.

f. Cable percentage conduit fill.

g. Cable sidewall bearing pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio.

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device.

3.4 UNDERGROUND STRUCTURE CONSTRUCTION

Provide standard type cast-in-place construction as specified herein and as indicated, or precast construction as specified herein. Horizontal concrete surfaces of floors must have a smooth trowel finish. Cure concrete by applying two coats of white pigmented membrane forming-curing compound in strict accordance with the manufacturer's printed instructions, except that precast concrete may be steam cured. Curing compound must conform to ASTM C309. Locate duct entrances and windows in the center of end walls (shorter) and near the corners of sidewalls (longer) to facilitate cable racking and splicing. Covers for underground structures

must fit the frames without undue play. Steel and iron must be formed to shape and size with sharp lines and angles. Castings must be free from warp and blow holes that may impair strength or appearance. Exposed metal must have a smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. Manhole locations, as indicated, are approximate. Coordinate exact manhole locations with other utilities and finished grading and paving.

3.4.1 Cast-In-Place Concrete Structures

Construct walls on a footing of cast-in-place concrete except that precast concrete base sections may be used for precast concrete manhole risers.

3.4.2 Precast Concrete Construction

Set commercial precast structures on 6 inches of level, 90 percent compacted granular fill, 3/4 inch to 1 inch size, extending 12 inches beyond the structure on each side. Compact granular fill by a minimum of four passes with a plate type vibrator. Installation must additionally conform to the manufacturer's instructions.

3.4.3 Pulling-In Irons

Provide steel bars bent as indicated, and cast in the walls and floors. Alternatively, pipe sleeves may be precast into the walls and floors where required to accept U-bolts or other types of pulling-in devices possessing the strengths and clearances stated herein. The final installation of pulling-in devices must be made permanent. Cover and seal exterior projections of thru-wall type pulling-in devices with an appropriate protective coating. In the floor the irons must be a minimum of 6 inches from the edge of the sump, and in the walls the irons must be located within 6 inches of the projected center of the duct bank pattern or precast window in the opposite wall. However, the pulling-in iron must not be located within 6 inches of an adjacent interior surface, or duct or precast window located within the same wall as the iron. If a pulling-in iron cannot be located directly opposite the corresponding duct bank or precast window due to this clearance limitation, locate the iron directly above or below the projected center of the duct bank pattern or precast window the minimum distance required to preserve the 6 inch clearance previously stated. In the case of directly opposing precast windows, pulling-in irons consisting of a 3 foot length of No. 5 reinforcing bar, formed into a hairpin, may be cast-in-place within the precast windows simultaneously with the end of the corresponding duct bank envelope. Irons installed in this manner must be positioned directly in line with, or when not possible, directly above or below the projected center of the duct bank pattern entering the opposite wall, while maintaining a minimum clear distance of 3 inches from any edge of the cast-in-place duct bank envelope or any individual duct. Pulling-in irons must have a clear projection into the structure of approximately 4 inches and must be designed to withstand a minimum pulling-in load of 6000 pounds. Irons must be hot-dipped galvanized after fabrication.

3.4.4 Cable Racks, Arms and Insulators

Cable racks, arms and insulators must be sufficient to accommodate the cables. Space racks in power manholes not more than 3 feet apart, and provide each manhole wall with a minimum of two racks. Space racks in signal manholes not more than 16 1/2 inches apart with the end rack being

no further than 12 inches from the adjacent wall. Methods of anchoring cable racks must be as follows:

a. Provide a 5/8 inch diameter by 5 inch long anchor bolt with 3 inch foot cast in structure wall with 2 inch protrusion of threaded portion of bolt into structure. Provide 5/8 inch steel square head nut on each anchor bolt. Coat threads of anchor bolts with suitable coating immediately prior to installing nuts.

b. Provide concrete channel insert with a minimum load rating of 800 pounds per foot. Insert channel must be steel of the same length as "vertical rack channel;" channel insert must be cast flush in structure wall. Provide 5/8 inch steel nuts in channel insert to receive 5/8 inch diameter by 3 inch long steel, square head anchor bolts.

c. Provide concrete "spot insert" at each anchor bolt location, cast flush in structure wall. Each insert must have minimum 800 pound load rating. Provide 5/8 inch diameter by 3 inch long steel, square head anchor bolt at each anchor point. Coat threads of anchor bolts with suitable coating immediately prior to installing bolts.

3.4.5 Field Painting

Cast-iron frames and covers not buried in concrete or masonry must be cleaned of mortar, rust, grease, dirt and other deleterious materials, and given a coat of bituminous paint.

3.5 UNDERGROUND CONDUIT AND DUCT SYSTEMS

3.5.1 Requirements

Run conduit in straight lines except where a change of direction is necessary. Provide numbers and sizes of ducts as indicated. Ducts must have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 3 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius must be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet must be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used must be 30 degrees and manufactured bends must be used. Provide ducts with end bells whenever duct lines terminate in structures.

3.5.2 Treatment

Ducts must be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers must be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer must be used whenever an existing duct is connected to a duct of different material or shape. Ducts must be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts must be thoroughly cleaned before being laid. Plastic ducts must be stored on a flat surface and protected from the direct rays of the sun.

3.5.3 Conduit Cleaning

As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

3.5.4 Jacking and Drilling Under Roads and Structures

Conduits to be installed under existing paved areas which are not to be disturbed, and under roads and railroad tracks, must be zinc-coated, rigid steel, jacked into place. Where ducts are jacked under existing pavement, rigid steel conduit must be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. For crossings of existing railroads and airfield pavements greater than 50 feet in length, the predrilling method or the jack-and-sleeve method will be used. Separators or spacing blocks must be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers.

3.5.5 Multiple Conduits

Separate multiple conduits by a minimum distance of 3 inches, except that light and power conduits must be separated from control, signal, and telephone conduits by a minimum distance of 12 inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly must consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of conduit assembly.

3.5.6 Conduit Plugs and Pull Rope

New conduit indicated as being unused or empty must be provided with plugs on each end. Plugs must contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

3.5.7 Conduit and Duct Without Concrete Encasement

Depths to top of the conduit must be not less than 24 inches below finished grade. Provide not less than 3 inches clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4 inch sieve. The first 6 inch layer of backfill cover must be sand compacted as previously specified. The rest of the excavation must be backfilled and compacted in 3 to 6 inch layers. Provide color, type and depth of warning tape as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

3.5.7.1 Encasement Under Roads and Structures

Under roads, paved areas, and railroad tracks, install conduits in concrete encasement of rectangular cross-section providing a minimum of 3 inch concrete cover around ducts. Concrete encasement must extend at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond the rails on each side of railroad tracks. Depths to top of the concrete envelope must be not less than 24 inches below finished grade.

3.5.8 Duct Encased in Concrete

Construct underground duct lines of individual conduits encased in concrete. Depths to top of the concrete envelope must be not less than 18 inches below finished grade, except under roads and pavement, concrete envelope must be not less than 24 inches below finished grade. Do not mix different kinds of conduit in any one duct bank. Concrete encasement surrounding the bank must be rectangular in cross-section and must provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 3 inches. Before pouring concrete, anchor duct bank assemblies to prevent the assemblies from floating during concrete pouring. Anchoring must be done by driving reinforcing rods adjacent to duct spacer assemblies and attaching the rods to the spacer assembly. Provide color, type and depth of warning tape as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

3.5.8.1 Connections to Manholes

Duct bank envelopes connecting to underground structures must be flared to have enlarged cross-section at the manhole entrance to provide additional shear strength. Dimensions of the flared cross-section must be larger than the corresponding manhole opening dimensions by no less than 12 inches in each direction. Perimeter of the duct bank opening in the underground structure must be flared toward the inside or keyed to provide a positive interlock between the duct bank and the wall of the structure. Use vibrators when this portion of the encasement is poured to assure a seal between the envelope and the wall of the structure.

3.5.8.2 Connections to Existing Underground Structures

For duct bank connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and bend out to tie into the reinforcing of the duct bank envelope. Chip the perimeter surface of the duct bank opening to form a key or flared surface, providing a positive connection with the duct bank envelope.

3.5.8.3 Connections to Existing Concrete Pads

For duct bank connections to concrete pads, break an opening in the pad out to the dimensions required and preserve steel in pad. Cut the steel and bend out to tie into the reinforcing of the duct bank envelope. Chip out the opening in the pad to form a key for the duct bank envelope.

3.5.8.4 Partially Completed Duct Banks

During construction wherever a construction joint is necessary in a duct bank, prevent debris such as mud, and, and dirt from entering ducts by providing suitable conduit plugs. Fit concrete envelope of a partially completed duct bank with reinforcing steel extending a minimum of 2 feet

back into the envelope and a minimum of 2 feet beyond the end of the envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately one footapart. Restrain reinforcing assembly from moving during concrete pouring.

3.6 CABLE PULLING

Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the manhole or buildings of the highest elevation. Use flexible cable feeds to convey cables through manhole opening and into duct runs. Do not exceed the specified cable bending radii when installing cable under any conditions, including turnups into switches, transformers, switchgear, switchboards, and other enclosures. Cable with tape shield must have a bending radius not less than 12 times the overall diameter of the completed cable. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

3.6.1 Cable Lubricants

Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables.

3.7 CABLES IN UNDERGROUND STRUCTURES

Do not install cables utilizing the shortest path between penetrations, but route along those walls providing the longest route and the maximum spare cable lengths. Form cables to closely parallel walls, not to interfere with duct entrances, and support on brackets and cable insulators. Support cable splices in underground structures by racks on each side of the splice. Locate splices to prevent cyclic bending in the spliced sheath. Install cables at middle and bottom of cable racks, leaving top space open for future cables, except as otherwise indicated for existing installations. Provide one spare three-insulator rack arm for each cable rack in each underground structure.

3.7.1 Cable Tag Installation

Install cable tags in each manhole as specified, including each splice. Tag wire and cable provided by this contract. Install cable tags over the fireproofing, if any, and locate the tags so that they are clearly visible without disturbing any cabling or wiring in the manholes.

3.8 CONDUCTORS INSTALLED IN PARALLEL

Conductors must be grouped such that each conduit of a parallel run contains 1 Phase A conductor, 1 Phase B conductor, 1 Phase C conductor, and 1 neutral conductor.

3.9 LOW VOLTAGE CABLE SPLICING AND TERMINATING

Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set. Make splices in underground distribution systems only in accessible locations such as manholes or, handholes.

3.10 MEDIUM VOLTAGE CABLE TERMINATIONS

Make terminations in accordance with the written instruction of the termination kit manufacturer.

3.11 MEDIUM VOLTAGE CABLE JOINTS

Provide power cable joints (splices) suitable for continuous immersion in water. Make joints only in accessible locations in manholes or handholes by using materials and methods in accordance with the written instructions of the joint kit manufacturer.

3.11.1 Joints in Shielded Cables

Cover the joined area with metallic tape, or material like the original cable shield and connect it to the cable shield on each side of the splice. Provide a bare copper ground connection brought out in a watertight manner and grounded to the manhole grounding loop as part of the splice installation. Ground conductors, connections, and rods must be as specified elsewhere in this section. Wire must be trained to the sides of the enclosure to prevent interference with the working area.

3.12 CABLE END CAPS

Cable ends must be sealed at all times with coated heat shrinkable end caps. Cables ends must be sealed when the cable is delivered to the job site, while the cable is stored and during installation of the cable. The caps must remain in place until the cable is spliced or terminated. Sealing compounds and tape are not acceptable substitutes for heat shrinkable end caps. Cable which is not sealed in the specified manner at all times will be rejected.

3.13 FIREPROOFING OF CABLES IN UNDERGROUND STRUCTURES

Fireproof (arc proof) wire and cables which will carry current at 2200 volts or more in underground structures.

3.13.1 Fireproofing Tape

Tightly wrap strips of fireproofing tape around each cable spirally in half-lapped wrapping. Install tape in accordance with manufacturer's instructions.

3.13.2 Tape-Wrap

Tape-wrap metallic-sheathed or metallic armored cables without a nonmetallic protective covering over the sheath or armor prior to application of fireproofing. Wrap must be in the form of two tightly applied half-lapped layers of a pressure-sensitive 10 mil thick plastic tape, and must extend not less than one inch into the duct. Even out irregularities of the cable, such as at splices, with insulation putty before applying tape.

3.14 GROUNDING SYSTEMS

NFPA 70 and IEEE C2, except provide grounding systems with a resistance to solid earth ground not exceeding 25 ohms.

3.14.1 Grounding Electrodes

Provide cone pointed driven ground rods driven full depth plus 6 inches, installed to provide an earth ground of the appropriate value for the particular equipment being grounded.
If the specified ground resistance is not met, an additional ground rod must be provided in accordance with the requirements of NFPA 70 (placed not less than 6 feet from the first rod). Should the resultant (combined) resistance exceed the specified resistance, measured not less than 48 hours after rainfall, notify the Contracting Officer immediately.

3.14.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies must be as recommended by the manufacturer. An embossing die code or other standard method must provide visible indication that a connector has been adequately compressed on the ground wire.

3.14.3 Grounding Conductors

Provide bare grounding conductors, except where installed in conduit with associated phase conductors. Ground cable sheaths, cable shields, conduit, and equipment with No. 6 AWG. Ground other noncurrent-carrying metal parts and equipment frames of metal-enclosed equipment. Ground metallic frames and covers of handholes and pull boxes with a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.14.4 Ground Cable Crossing Expansion Joints

Protect ground cables crossing expansion joints or similar separations in structures and pavements by use of approved devices or methods of installation which provide the necessary slack in the cable across the joint to permit movement. Use stranded or other approved flexible copper cable across such separations.

3.14.5 Manhole Grounding

Loop a 4/0 AWG grounding conductor around the interior perimeter, approximately 12 inches above finished floor. Secure the conductor to the manhole walls at intervals not exceeding 36 inches. Connect the conductor to the manhole grounding electrode with 4/0 AWG conductor. Connect all incoming 4/0 grounding conductors to the ground loop adjacent to the point of entry into the manhole. Bond the ground loop to all cable shields, metal cable racks, and other metal equipment with a minimum 6 AWG conductor.

3.14.6 Fence Grounding

Provide grounding for fences as indicated.

3.15 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with NFPA 70 and Section 31 23 00.00 20 EXCAVATION AND FILL.

3.15.1 Reconditioning of Surfaces

3.15.1.1 Unpaved Surfaces

Restore to their original elevation and condition unpaved surfaces disturbed during installation of duct. Preserve sod and topsoil removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged by sod of quality equal to that removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface with the same quantity and formula of seed as that used in the original seeding, and provide topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

3.15.1.2 Paving Repairs

Where trenches, pits, or other excavations are made in existing roadways and other areas of pavement where surface treatment of any kind exists. Make repairs as specified in Section 32 12 17 HOT MIX BITUMINOUS PAVEMENT.

3.16 CAST-IN-PLACE CONCRETE

Provide concrete in accordance with Section 32 16 13 CONCRETE SIDEWALKS AND CURBS AND GUTTERS.

3.16.1 Concrete Slabs for Equipment

Unless otherwise indicated, the slab must be at least 8 inches thick, reinforced with a 6 by 6 - W2.9 by W2.9 mesh, placed uniformly 4 inches from the top of the slab. Slab must be placed on a 6 inch thick, well-compacted gravel base. Top of concrete slab must be approximately 4 inches above finished grade with gradual slope for drainage. Edges above grade must have 1/2 inch chamfer. Slab must be of adequate size to project at least 8 inches beyond the equipment.

Stub up conduits, with bushings, 2 inches into cable wells in the concrete pad. Coordinate dimensions of cable wells with transformer cable training areas.

3.17 FIELD QUALITY CONTROL

3.17.1 Performance of Field Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.17.1.1 Medium Voltage Cables

Perform tests after installation of cable, splices, and terminators and before terminating to equipment or splicing to existing circuits.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Inspect for proper shield grounding, cable support, and cable termination.

(4) Verify that cable bends are not less than ICEA or manufacturer's minimum allowable bending radius.

(5) Inspect for proper fireproofing.

(6) Visually inspect jacket and insulation condition.

(7) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform a shield continuity test on each power cable by ohmmeter method. Record ohmic value, resistance values in excess of 10 ohms per 1000 feet of cable must be investigated and justified.

(2) Perform acceptance test on new cables before the new cables are connected to existing cables and placed into service, including terminations and joints. Perform maintenance test on complete cable system after the new cables are connected to existing cables and placed into service, including existing cable, terminations, and joints. Tests must be very low frequency (VLF) alternating voltage withstand tests in accordance with IEEE 400.2. VLF test frequency must be 0.05 Hz minimum for a duration of 60 minutes using a sinusoidal waveform. Test voltages must be as follows:

CABLE RATING AC TEST VOLTAGE for ACCEPTANCE TESTING	
5 kV	10kV rms(peak)
8 kV	13kV rms(peak)
15 kV	20kV rms(peak)
25 kV	31kV rms(peak)
35 kV	44kV rms(peak)

CABLE RATING AC TEST VOLTAGE for MAINTENANCE TESTING	
5 kV	7kV rms(peak)
8 kV	10kV rms(peak)
15 kV	16kV rms(peak)
25 kV	23kV rms(peak)

CABLE RATING AC TEST VOLTAGE for MAINTENANCE TESTING	
35 kV	33kV rms(peak)

3.17.1.2 Low Voltage Cables, 600-Volt

Perform tests after installation of cable, splices and terminations and before terminating to equipment or splicing to existing circuits.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Verify tightness of accessible bolted electrical connections.

(4) Inspect compression-applied connectors for correct cable match and indentation.

(5) Visually inspect jacket and insulation condition.

(6) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 1000 volts dc for one minute.

(2) Perform continuity tests to insure correct cable connection.

3.17.1.3 Grounding System

a. Visual and mechanical inspection

Inspect ground system for compliance with contract plans and specifications

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method in accordance with IEEE 81. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable megohmmeter tester in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument must be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

3.17.2 Follow-Up Verification

Upon completion of acceptance checks and tests, show by demonstration in service that circuits and devices are in good operating condition and

properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer must be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --